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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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Changing with the Times

THREE changes in what may be called the mentality of chemists have been making themselves apparent for some time. The first is the tendency of separate organisations to act more together. It is becoming quite common, especially in provincial centres, for the sections of different societies to hold joint meetings, in that way securing larger attendances, pooling the expenses, extending the benefits derived from discussions and interchange of ideas, and bringing all the members into a kind of professional fellowship. The movement has gone so far as to justify Professor Morgan in suggesting that the administration of the Institute and the B.A.C. should be conducted from one office, and that a single composition subscription should be arranged to cover membership of the principal organisations. The movement is good from nearly every point of view; the only danger is that of excessive centralisation, which, unless guarded against, sometimes leads to monopoly and sterilisation.

The second is the desire to avoid the old seclusion and develop a public side to chemistry. Chemistry, which must always be pursued largely in the laboratory, never can make the direct appeal to the public imagination which some other professions do; at the same time it is good for chemical science and good for the nation that they should know a little more of each other, and the work of interpretation is proceeding. In addition, the industry now takes its place with others at public exhibitions, and the demonstration, both scientific and industrial, which is being organised for Wembley next year promises to be the most impressive in the history of British chemistry. The most novel form of publicity, radiation by wireless, has so far not been more than moderately successful—the experience of the B.B.C. last week was that the speeches elicited only a tepid response from listeners-in—but this experiment is in its infancy, and ways may yet be found of making the appeal more effective.

The third sign is the widening interest of the younger race of chemists in matters of general interest. Laboratory work, the basis of all progress in the science, will always demand and produce a distinctive laboratory type, but the outlook of even this type is less esoteric than of old, and the proportion of research workers incapable of speaking or writing except in the terms of formulæ is steadily diminishing. These and other signs all point to an extension of mental outlook and interest, and the effect must presently be to give the profession and industry a larger and better place in public estimation.

Pulverised Fuel or Mechanical Stokers?

WHEN Mr. David Brownlie starts to speak on the subject of fuel utilisation in its relation to steam-raising he is always assured of an attentive audience, for, apart from any personal attributes which he possesses as a speaker, he has probably had more experience in the intimate working of steam boilers than any other fuel expert in the country. Recently Mr. Brownlie read a most comprehensive paper on the subject of pulverised fuel before the Institution of Electrical Engineers; and, as this method of firing, which is still something of a novelty in this country, has attracted quite an unusual amount of attention among chemical engineers, we feel that the latter would do well to study the full text of the paper.

Quite a number of points of interest were brought out by Mr. Brownlie. We learn, for instance, that in America within the next few months no less than 3½ million tons of coal per annum will be employed by one pulverulent system alone—*i.e.*, a total of nearly half the power-station capacity of the whole of the United Kingdom. In view of the rate at which the system has gone ahead in America, it is difficult to understand why it has made such slow progress over here, and the only large boiler plant using pulverised fuel in this country is believed to be that at the Hammersmith electricity supply station, where there are three boilers evaporating approximately 45,000 lb. of water per hour. Personally, we are still inclined to the opinion that some of the regrettable accidents

which occurred in the early days of pulverised fuel firing continue to exert an influence on the British engineer, and our rather dilatory response to what is undoubtedly a great step forward in the utilisation of fuel is merely another illustration of our scepticism of everything in the way of novelties until someone else's experience has clearly demonstrated that they are something more than technical mares' nests.

Much—perhaps too much—has been made of the fact that mixtures of coal dust and air are explosive; but investigation has shown that explosions have in all cases arisen from causes which are preventable, and which are not inherent in the nature of the operations carried on in the plant. Only quite recently one well-known authority (not Mr. Brownlie) remarked that the possibility of explosion in a well-designed, properly-inspected, and properly-maintained plant is, to say the least of it, remote. Surely, therefore, it is time we took our courage in both hands and started more earnestly to follow the lead of America.

This country has shown no lack of enterprise in the adoption of mechanical stokers, and yet, summarising the position of pulverised fuel as compared with mechanical stoking, Mr. Brownlie says that under the best conditions the former gives 86 per cent. boiler efficiency and the latter 81½ per cent. Pulverised fuel is, however, much easier to work in obtaining these figures, the amount of unburned fuel in the ash is about one-fifth of that with mechanical stoking, it permits of steam being got up more quickly, and the system is altogether more flexible as regards the character of the fuel. Again, pulverised fuel lends itself to the latest methods of scientific control from a switchboard in a manner almost impossible with mechanical stoking.

"Wetting Power"

In the fifth report on Colloid Chemistry which we have just received from the Department of Scientific and Industrial Research there is included an extremely readable and interesting paper on an essential property of certain substances which is not commonly brought before the industrial chemist. Mr. W. H. Nuttall deals with the applications of "wetting power," and points out that many industrial processes are designedly based upon the power of a liquid to wet the surface of a solid—*e.g.*, mineral separation processes, and in the application of tree sprays, cattle dips, etc. The explanation of "wetting" still appears to be obscure, and the framing of a simple method for determining the wetting power of a liquid is attended with considerable difficulty. Mr. Nuttall deals fully with the suggestions which have been made with this object in view, but the general run of industrial chemists will find chief interest in his descriptions of the part which this important property plays, particularly in froth flotation.

It is computed that flotation methods are now applied to about 60 million tons of ore annually, the process being mainly, though by no means entirely, concerned with sulphide ores. It is based upon the differences shown by various substances in the degree to which they are wetted by water or other liquid. Thus water wets quartz (gangue) more readily than a mineral sulphide. This difference in "wettability" is accentuated by the addition of a small appropriate quantity of a suitable oil, which, by being selectively adsorbed on to the surface of the sulphide, renders it more difficult to wet. Similarly, by the addition of an acid or alkali, the surface of the quartz is made more easily wettable. In the earlier methods the unwetted particles of sulphide were allowed to rise to the surface and were then skimmed off (skin flotation), but in modern practice air is forced through the mixture, when the sulphide particles are adsorbed at the surface of the air bubble and carried upwards (froth flotation). A recent adaptation has been the separation of bitumen from rock, while another application of differential wetting is the separation of mineral matter from coal, but it is doubtful whether in this country such a process could be worked profitably. In Germany recently a froth flotation process has been patented for the separation of graphite from its ores. Those who are interested in, or closely associated with, processes in which wetting power plays an important *rôle*, would do well to purchase the report (obtainable at H.M. Stationery Office, price 2s. 6d.) containing Mr. Nuttall's interesting paper.

The Improvement in Chemical Trade

An election has usually a slightly depressing effect on trade and this occasion has scarcely been exceptional, the general exports of the country during November being below those of the corresponding month last year. The imports, however, were increased, and the chemical trade has done well in showing an increase in both exports and imports under the official heading "chemicals, dyes, drugs and colours." Compared with last year these increases amount in value to £139,000 in imports and £70,196 in exports. These figures, however, are below those of October, which was an exceptionally good month. It is significant that in spite of the general fluctuations in trade November is the third consecutive month with satisfactory chemical trade figures, particularly in exports, a fact which would seem to indicate that English chemicals are definitely becoming more widely appreciated abroad. In this connection British-made synthetic dyes continue to keep up their excellent export figures, the percentage increase for the month under consideration being about 150, a somewhat lower figure than that reached in some previous months, but nevertheless a matter of congratulation.

Japan's Chemical Industry

Official advices from Japan show that though considerable damage has been done to chemical works by the recent earthquake, it is less severe in the case of many chemical works than might have been expected. The total losses of the Japan Artificial Fertiliser Co., which had many factories in the earthquake area, are estimated at yen 4,650,000. There is little immediate hope of the restoration of the works destroyed by fire, but no special anxiety exists with regard to supplies of raw materials, and stocks saved are expected to be equal to the demand. At the firm's Oji factory one-tenth of the sulphuric acid plant was destroyed and one quarter of the electrolysis plant, while at Komatsugawa three of the retorts for making sulphuric acid collapsed. The chemical and electrolysis works were

expected to be restored by the end of the year. The Tokio Sulphuric Acid Co. escaped with scarcely any damage, and the supply of motive power enabled operations to be resumed without delay. Similar good fortune attended the Asahi Electric Industries Co., who manufacture bleaching powder, caustic soda, solidified oils, and hydrochloric acid, the Japan Chemical Manufacturing Co., manufacturers of barium sulphate, salts of iodine, cosmetics and fertilisers, and the Iriye Chemical Manufacturing Co., manufacturers of acids, brewing materials, ethyls, etc. The Taisho Turpentine Co. had their laboratories demolished, and several paint, celluloid and glass works were damaged; in the case of the Asano Cement Co. and the Ishikawa Pottery, who manufacture chemical porcelain, reconstruction is expected to occupy a year. On the whole, however, it is satisfactory to learn that so many works of a chemical character have survived the disaster.

A Reminder to Employers

MOST employers of labour are probably already aware of the changes—some of them drastic—which have been made in the conditions of workmen's compensation by the Act which comes into force on New Year's Day. In future the term "workman" is not only to include all persons engaged in manual labour, quite irrespective of the amount of their annual earnings, but those engaged on other than manual work, providing their remuneration does not exceed £350. The liability of employers is extended to accidents resulting in the death or serious and permanent disablement of workmen, even where such accidents are due to the workmen acting contrary to regulations or without the employer's instructions—if it can be proved that the act was committed in the interests of the employer. In cases of total dependence the maximum and minimum amounts of compensation payable are raised respectively from £300 and £150 to £600 and £200, medical and funeral expenses from £10 to £15, and the maximum weekly payment from 20s. to 30s., whilst, though the basis of compensation remains at one-half of the average weekly earnings, in the case of a man whose wages were less than 50s. a week his rate of compensation may be as high as 75 per cent. of his earnings. There are other changes, but those mentioned sufficiently emphasise the importance of all employers of labour assuring themselves that, as from January 1, their liability under the new Act is fully covered.

"C.A." Annual Review Number

NEXT week we shall publish our Annual Review Number. These issues in the past have been greatly appreciated, as they supply a review of the chemical developments of the year of a kind no other British journal has even attempted. This year, we think it may confidently be stated, our Annual Review Number will mark an advance on all its predecessors, admittedly good as those have been. In addition to a carefully compiled retrospect of the year, the contents will include articles on the dyestuffs industry by Sir William Alexander, M.P., on the nitrogen industry by Dr. E. B. Maxted, on the chemical inventions of the year by our Patent Correspondent, on the heavy chemical industry by Mr. P. Parrish, A.I.C., on the fine chemical industry by a staff correspondent, on the chemical fertiliser industry by Dr. S. Williamson, and on the chemical trade conditions of the year by Mr. W. G. Wilson. In addition there will be the usual notes on the work of the principal chemical and allied societies. Our previous Annual Review numbers have been so quickly sold out that readers who wish to be sure of a copy for filing may be advised to order in good time.

The Chemical Age Year Book and Diary, which was so warmly welcomed on its first appearance last year, is now out of the press. Regular subscribers for 1924 are entitled to a free copy, which in the case of postal subscribers will be received through the post in the usual way. Subscribers who receive their copies otherwise than through the post should take early steps to ensure the receipt of their copies and may communicate for this purpose with the Manager, 8, Bouverie Street, E.C.

Points from Our News Pages

The second and concluding instalment is published of the article by H. M. Bunbury, M.Sc. on "The Constitution of Colophony (p. 678).

The subject for discussion at a chemical engineering conference in Liverpool last week was "Methods of extracting oils from seeds," which was dealt with in a paper by Mr. J. T. Brewis (p. 680).

It was suggested at a dinner of Midland chemists on Saturday in Birmingham that the affairs of the Institute and B.A.C. might be administered from one office and that a composition fee might be arranged for all chemical associations (p. 684).

The subject of "Recent advances in the study of corrosion" is discussed in a paper by Dr. J. Newton Friend (p. 684).

Attention is drawn, in a paper before the Leeds Section of the Institute of Chemistry, to the importance of having patents endorsed "Licences of Right" (p. 685).

According to our London Market Report business has shown surprising activity during the past week (p. 694).

During the past week business in the Scottish Heavy Chemical Market has been more satisfactory, according to our report (p. 697).

Books Received

DANGEROUS GOODS. By Dr. Jules Aeby. London: Crosby Lockwood and Son. Pp. 318. 30s.

PULVERISED AND COLLOIDAL FUEL. By J. T. DUNN. London: Ernest Benn, Limited. Pp. 196. 25s.

ELEKTROLYTISCHE METAL-ABSCHEIDUNGEN. By Georg Buchner. Berlin: M. Krayn. Pp. 304. 10s.

DAS ATZEN DER METALLE UND DAS FARBEN DER METALLE. By Georg Buchner. Berlin: M. Krayn. Pp. 208. 5s.

LABORATORY EXPERIMENTS ON PHYSICO-CHEMICAL PRINCIPLES. By Miles S. Sherrill. New York: The MacMillan Co. Pp. 126.

A COURSE IN GENERAL CHEMISTRY. By William C. Bray and Wendell M. Latimer. New York: The MacMillan Co. Pp. 148.

THE CHEMISTRY AND PHYSICS OF CLAYS AND OTHER CERAMIC MATERIALS. By Mr. A. B. Searle. London: Ernest Benn, Ltd. Pp. 696. 55s.

SANDS AND CRUSHED ROCKS. Vols. 1 and 2. By Alfred B. Searle. London: Henry Frowde and Hodder and Stoughton. Pp. 476 and 282. 52s. 6d.

REPORT ON THE ECONOMIC SITUATION OF THE NETHERLANDS EAST INDIES TO JUNE, 1923. By H. A. N. Bluett. Issued by the Department of Overseas Trade. London: H.M. Stationery Office.

FIFTH REPORT ON COLLOID CHEMISTRY AND ITS GENERAL AND INDUSTRIAL APPLICATIONS. Department of Scientific and Industrial Research. London: H.M. Stationery Office. Pp. 130. 2s. 6d.

The Constitution of Colophony—(II)

American Colophony and the Structure of Abietic Acid

By H. M. Bunbury, M.Sc.

Colophony, which is commercially known as rosin, is extensively employed in the chemical industry in the manufacture of paper, soaps, varnishes, etc. Its principal source is the long-leaf yellow pine, and recent attention which has been given to its constitution has now, according to the writer, elucidated a long-standing problem. The article, the first portion of which appeared last week, is now concluded.

French Colophony and the Oleoresins

INVESTIGATIONS of the chemical constitution of the chief constituents of French colophony have not progressed so far as have those of the American product. Indeed, it may be said at once that the oleoresin, galipot, has been more fully investigated than has the colophony obtained from it. There appear to be complicating factors which render the elucidation of problems of constitution more difficult in the case of the French product. Some of these have been brought to light as a result of researches on the acids present in the original raw material, the oleoresin. Since these researches are of fundamental importance, and their results constitute a considerable proportion of our knowledge concerning both the resin and the colophony, it will be necessary to consider the former in some detail.

Galipot

The oleoresin from *Pinus maritima* consists principally of terpenes (*l*-α-pinene and β-pinene, which constitute the turpentine portion) and colophenic acids. The latter have been named pimaric acids from the botanic designation of the pine from which they are obtained. The chief acids present are dextropimaric and laevopimaric, though there are doubtless others present beside these. Thus, Tschugaeff and Teearu (Ber., 46, 1771, 1913) conclude from optical data that there are at least three acids present. There is also a small proportion of neutral substances. The two pimaric acids are, however, the main constituents, but nothing is known with certainty of the relative proportions of each acid in the galipot.

Dextropimaric Acid

This acid was first isolated from galipot in a state of purity by Caillot in 1874. In 1885–6 Vesterberg described an improved method for its isolation. He obtained an acid having m.p. 210–11°, and $[\alpha]_D = +72{\cdot}5°$ (in chloroform). These constants have been confirmed by later investigators with, however, some slight variations in the value for the specific rotation. It is the most stable of all the colophenic acids, and resists the action of acetic acid and high temperatures; indeed, it can be recrystallised unchanged from glacial acetic acid. This is in direct contrast to the behaviour of the abietic acids, and serves to characterise dextropimaric acid as quite distinct among the colophenic acids.

Several methods have been described for the preparation of pure dextropimaric acid from galipot or colophony. The simplest method is that described by Ruzicka and Balas (Helv. Chim. Acta, VI, 4, 677, 1923), which is a modification of that originally employed by Vesterberg. It consists in digesting the oleoresin several times with 75 per cent. alcohol and pressing the residue between cloth. The mass is then recrystallised twice from 80 per cent. alcohol, dissolving up at 60°. The product is obtained in the form of white crystals and in a yield of about 20 per cent. of the resin taken. This product is a mixture of acids. The crystals are further treated by dissolving in hot caustic soda (15 parts of NaOH in two litres of water for each 100 parts of acid), and allowing to stand for several days in the cold. The sodium salt of the dextropimaric acid is precipitated in the form of pearly plates. These are then dissolved up in boiling water and dilute acetic acid added. The free dextropimaric acid is precipitated, and is recrystallised three times from acetone. The yield is about 11 per cent. of the acid mixture or 2 per cent. of the galipot.

Dextropimaric acid has the empirical formula $C_{20}H_{30}O_2$. A determination of the molecular refraction of the methyl and ethyl esters gave values agreeing closely with those calculated on the assumption of the presence of two double bonds. It also forms a triozonide under the same conditions as for abietic acid. This evidence is more reliable than that furnished by the formation of a tetrahydro derivative by energetic reduction; the latter may result from the disruption of a labile ring. The sulphurisation method previously described for abietic acid did not yield retene, but a new hydrocarbon having the composition $C_{16}H_{14}$; it thus contains two carbons and four hydrogens less than retene, and appears to be a dimethyl phenanthrene. The evidence, which awaits confirmation, points strongly to dextropimaric acid being a dimethylisopropyldecahydrophenanthrene. If this is so, the isopropyl group must be eliminated by the sulphur treatment, just as a methyl group is eliminated in the case of abietic acid, and is therefore attached to a tertiary carbon atom, possibly the same one that carries the methyl group in abietic acid. The sulphurisation reaction may be formulated thus:—

$$C_3H_7{\cdot}(CH_3)_2{\cdot}C_{14}H_{16}COOH + 5S \rightarrow (CH_3)_2{\cdot}C_{14}H_8 + C_3H_7{\cdot}SH + 4H_2S + CO_2$$

Dextropimaric acid — New hydrocarbon

Dextropimaric acid therefore belongs to a type of colophenic acid different from that to which abietic and laevopimaric acid belong.

Laevopimaric Acid

Both galipot and colophony contain in considerable quantity a very strongly laevorotatory acid which is isomeric with dextropimaric and abietic acids. It has m.p. 140–150° and $[\alpha]_D$ about −270°. It was first noticed as a constituent of galipot by Caillot, and later Vesterberg obtained it in a pure state and named it laevopimaric acid. The following method of separation of laevo- and dextro-pimaric acids is described by Ruzicka and Balas (l.c.). The crystalline mixed acids are first obtained as described above for the preparation of dextropimaric acid. These are dissolved in 3 per cent. NaOH at 60°, and a current of CO_2 is led through the solution at this temperature. A precipitate of free acids is thus obtained which has m.p. of 160–175° and $[\alpha]_D$ about −90°. Separation is now effected by fractional crystallisation from acetone. The acids are dissolved in boiling acetone, the solution cooled, and the precipitate filtered off. This is fraction I. After concentration of the liquors a further fraction is obtained. Six fractionations are made in this way, the final liquors being evaporated almost to dryness to give a last fraction (VII). Further recrystallisations of fractions IV–VII give the laevopimaric acid, the first three fractions being similarly worked up for the dextro-acid. Laevopimaric acid is very closely related to abietic acid. It is isomerised by hydrochloric acid, giving the same acid, m.p. 171°, as that obtained from abietic acid, and Dupont (Bull. soc. chim. [4], 29, 727, 1921) has shown that the isomerisation product with hydrochloric acid is identical with that obtained by Schulz (Chem. Zeit., 41,666, 1917) from American colophony by the same method. It is practically certain, therefore, that laevopimaric acid belongs to the abietic group of colophenic acids.

French Colophony

The colophony obtained in the production of French gum turpentine from galipot consists principally of a mixture of colophenic acids together with a small quantity of hydrocarbons. These latter are probably polyterpenes, but they have not yet been investigated. It is probable that all the acids have the general formula $C_{20}H_{30}O_2$ and that they are isomers of abietic acid. The colophony, whose specific rotation varies from about −15° to + 15°, yields, on vacuum distillation, products more strongly laevorotatory, just as does American colophony. Thus, when distilled under a pressure of <1 mm, it yields a product which, when recrystallised three times from acetone, gives an acid of m.p. 159–161° and $[\alpha]_D = -63°$. Both in this and other respects, this acid is practically identical with the abietic acid obtained from American colophony by Ruzicka and Meyer (l.c.) under the same conditions. It thus appears that, with the exception of dextropimaric acid, the acids of French colophony are largely those which are the main constituents of American colophony.

Other Oleoresin Acids

The properties and constitution of the acids of other conifer oleoresins, other than those described above, have been little investigated. The work is of importance from the point of view of the commercial outlook of the turpentine and rosin industries, but, apart from commercial considerations, these investigations are of great interest in assisting to throw light on the fascinating problem of the mechanism of the processes of plant synthesis. In 1906, Klason and Köhler (J. pr. Ch. [2], 73,337) isolated two colophenic acids from Swedish pine (*P.abies*) by direct recrystallisation of the resin. These acids had the composition $C_{20}H_{30}O_2$. One was laevorotatory, having $[\alpha]_D = -59.4°$ and m.p. 198–9°, which they called α-colophenic acid; the other, β-colophenic acid, was dextrorotatory, having $[\alpha]_D = +52.2°$ and m.p. 168–173° Leskiewicz (J. pr. Ch. [2], 81, 403, 1910) by recrystallisation of the resins from *Pinus sylvestris* (Poland) and *Pinus maritima*, obtained acids termed by him "sapic" acids. These had the formula $C_{20}H_{30}O_2$. Similar acids were obtained from the colophonies from these resins. One of these acids, obtained by distillation of the colophony, had m.p. 191° and $[\alpha]_D = -56.3°$ and appeared to be identical with Klason and Köhlers' α-colophenic acid. In 1912, Köhler (J. pr. Ch. [2], 85, 523, 534) isolated laevopimaric acid from the "winter resin" of *Picea excelsa*. The "winter resin" is a white crystalline substance found under the bark of pine and fir trees in late winter and early spring, generally about January to April. He also examined the oleoresin from the same tree and concluded that the parent substance of the colophenic acids is an aldehyde having the composition C_9H_{15}·CHO and which oxidises to the acid C_9H_{15}·COOH. Condensation of one molecule of each of these compounds then brings about the formation of the colophenic acids, $C_{20}H_{30}O_2$, thus :—

$$C_9H_{15}\cdot CHO + C_9H_{15}\cdot COOH = C_{19}H_{29}\cdot COOH + H_2O$$

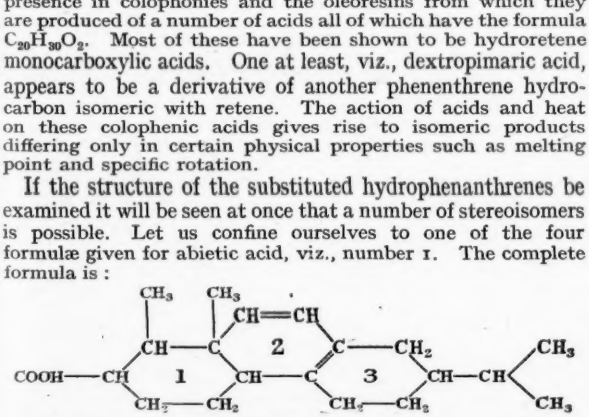
Grün (Zeit. deutsch Oel-Fett. Ind. 41, 49, 1921) has suggested the formation of colophenic (abietic) acid by condensation of one molecule each of α-pinene and β-pinene, followed by oxidation to the acid. Neither of these hypotheses has so far been supported by experimental evidence, though it is very probable that the simple terpenens $C_{10}H_{16}$ are intermediates in the building up of the more complex phenanthrene derivatives which constitute the class of colophenic acids.

Sureda Blanes (Anales Soc. españ. fis. quim. 13, 176, 1915) describes the isolation from Spanish colophony by distillation at 12 mm. of an acid having m.p. 153–4° and $[\alpha]_D = -58°$, constants almost identical with those for abietic acid. Ruzicka and Schinz, by recrystallisation of a Swiss oleoresin, obtained a strongly laevorotatory acid having m.p. 142–4° and $[\alpha]_D = -138$. Treatment with boiling glacial acetic acid gave a product almost identical with abietic acid in melting point, specific rotation and crystal form.

Isomerism of the Colophenic Acids

The experimental evidence outlined above has proved the presence in colophonies and the oleoresins from which they are produced of a number of acids all of which have the formula $C_{20}H_{30}O_2$. Most of these have been shown to be hydroretene monocarboxylic acids. One at least, viz., dextropimaric acid, appears to be a derivative of another phenenthrene hydrocarbon isomeric with retene. The action of acids and heat on these colophenic acids gives rise to isomeric products differing only in certain physical properties such as melting point and specific rotation.

If the structure of the substituted hydrophenanthrenes be examined it will be seen at once that a number of stereoisomers is possible. Let us confine ourselves to one of the four formulæ given for abietic acid, viz., number 1. The complete formula is :



By building up such a three-ring system on the carbon tetrahedral model it will be seen that where two rings have a double bond in the condensation position, *i.e.*, between the two common carbon atoms, these two rings lie in the same plane. Further, if two rings have their common carbon atoms singly linked, then the two rings are at an angle of 109° to each other. In the above formula rings 2 and 3 are in the same plane and ring 1 is at an angle of 109° to them. Now the spacial configuration of the substituent groups, methyl, isopropyl and carboxyl, will give rise to stereoisomers, depending on their relative cis- or trans-positions, just as in in the case of the cis- and trans-isomers of the substituted cyclohexanes investigated by Auwers (Ann. 420, 84, 1920), Skita (Ann. 427, 255, 1922), and Chavanne and Becker (Bull. Soc. Chim. belg. 31, 95, 1922). In addition there is the possibility of the presence of acids having double bonds in positions other than those shown in the above formula. These would again give rise to another set of isomers. Finally, there is to be considered the presence of position isomers in which the substituent groups occupy positions in the phenanthrene nucleus different from those in abietic acid. Dextropimaric acid appears to belong to this class. The production of so many colophenic acids according to the source and method of treatment is thus satisfactorily explained and the apparent complexity of many of the acids accounted for.

Historical Notes on Fermentation

Professor Ling's Address at Nottingham

At a meeting of the Nottingham Section of the Society of Chemical Industry on Wednesday, December 12, Professor A. R. Ling, F.I.C., gave a lecture on "Some Points in the History of Fermentation, particularly as Applied to the Brewing Industry."

Professor Ling first gave a comprehensive definition of fermentation, and showed that it was a process connected with life (directly or indirectly) which brought about the breaking down of a substance with the evolution of heat. Then followed a brief outline of the history of fermentation, in which it was shown that certain fermentations had been known since the earliest times, such as the making of wine from rice and bread from wheat in China (2,000 B.C.) and the preparation of beer from barley in Egypt (4th Dynasty). Professor Ling then dealt with the modern history of fermentation, and indicated three epochs, commencing with the chemical epoch in which Stahl propounded the theory that a ferment was a body in an active state of motion which it was capable of communicating to other bodies. Lavoisier, Gay Lussac, Leeuwenhock, Schwann, Berzelius, Wöhler and Liebig all made contributions to the theoretical and practical sides of fermentation. The three last-named chemists ridiculed the idea that yeast was a living organism, but were forced to admit this fact after Pasteur began his work. With Pasteur's classical researches commenced the second or biological epoch, and these showed that alcoholic fermentation was concerned with the life and not the death of yeast. The third or biochemical epoch was opened in 1897 by the discovery by E. Buchner, who demonstrated that the alcoholic fermentation of sugar was brought about by the enzyme zymase present in the yeast. Professor Ling finally described the essential features of malting and brewing; he mentioned that the finished malt contained very little maltose, but chiefly starch with some saccharose. Aeration of both steeping liquor and wort was important, and the fermentation of wort by yeast proceeded in two stages—aerobic, followed by anaerobic fermentations.

In the discussion which followed Professor Kipping inquired as to the cause of the production of saccharose in the finished malt; also as to the power of one yeast to take on the function of another species.

Mr. Pentecost asked if there was any method for regulating the action of diastase on thick starch in the production of thin starch used in textile stiffening.

In reply, Professor Ling stated that as yet no chemical explanation had been found to account for the presence of saccharose in malt. In the case of the intraconvertibility of different yeasts, really every yeast was a product of its environment, and in the course of time could acquire different characteristics and functions. Hansen was forced to admit this fact, although for many years he had denied the possibility. It should not be difficult to regulate the action of diastase on starch by making use of the polarimeter, Fehling's and iodine reactions. All enzymes in starch solution were destroyed at 212° F. (best by rapid heating) and also by the addition of alkali.

Methods of Extracting Oils from Seeds

Chemical Engineering Conference in Liverpool

A VERY well attended joint meeting of the Liverpool Section of the Society of Chemical Industry and the Chemical Engineering Group was held in Liverpool on Wednesday, December 12. This was the first joint meeting of the kind held in the city and its success may be judged by the fact that the number present at times exceeded the accommodation.

The proceedings opened in the afternoon with a visit arranged by the Hon. Secretary of the Liverpool Section (Mr. E. G. Jones) to the African Oil Mills of the Co-operative Wholesale Society, where a party of 30 was conducted round the works, and the operations of oil extraction were personally examined. This proved a fitting preliminary to the Paper by Mr. J. T. Brewis on "The Extraction of Oils from Seeds, Nuts, and Kernels," which was read after tea in the club rooms of the Overseas League, Mr. Edwin Thompson, Chairman of the Liverpool Section of the Society of Chemical Industry, being in the chair. The Paper provoked a keen discussion, particularly as there were several American visitors present and it was possible to bring out the comparison between English and American methods of oil extraction. The discussion finally had to be curtailed, with the promise of a fuller time on another occasion, in order that the members and visitors might adjourn to an informal dinner which was held at the University Club. Among those present at the meeting were Mr. J. Arthur Reavell, chairman of the Chemical Engineering Group, Mr. C. S. Garland, vice-chairman, Mr. F. H. Rogers, the hon. treasurer, Professor J. W. Hinchley and Mr. H. J. Pooley (who had all come from London), and Mr. James MacGregor, who had come from Glasgow.

The whole of the arrangements were admirably carried out, many of the visitors expressing the opinion that they had never had such a cordial reception, and the organisation of the meeting reflected great credit on the hon. local secretary of the Society of Chemical Industry.

Abstract of the Paper

It may be necessary (Mr. Brewis stated in the course of his paper) to extract the oil from cotton, til or rape seeds, soya beans, ground-nuts, babassu kernels, copra, palm kernels, shea nuts, mowha seed, linseed or castor seed, and as practically each of these seeds and nuts possesses some distinct peculiarity, calling for special treatment, few mills are in a position to handle the complete range in the most efficient manner. The method of abstracting the oil is frequently a matter of compromise—to suit the available plant.

The raw materials of the English mill—the seeds, nuts, and kernels, come from all corners of the earth; some are cultivated, others grow wild. They pass through so many and varied vicissitudes that the average good quality on arrival at the mill is surprising. The quantity of foreign matter in seed is very variable, and as it was not carefully distributed throughout the parcel at the place of origin the buying sample is not a reliable check. The point for a critical inspection of the seed is at the mill intake for bulk seed, and the warehouse for bag seed.

Cleaning of Woolly Cotton Seed

The cleaning of woolly cotton seed is a problem which has received much more attention in America than in this country. This is, no doubt, due to the fact that in the early days of cotton-seed crushing in this country, the seed was mainly the Egyptian variety, which has no adhering cotton and is known as "black" seed. When the woolly varieties arrived the crusher was eventually faced with the problem of removing, in addition to loose sand and stones, the dirt in the lint. The evolution of the plant appears to have remained entirely in the hands of the crusher.

Woolly seed may be divided into two classes:—

1. Seed with fairly long outer lint covering a short tough fibre firmly attached to the seed husk.
2. Seed with no long lint but covered with the short tough fibre.

To obtain the best possible yield of oil from woolly cotton seed milled on the undecorticated system, the long lint and short fibre must be removed, the seed should be sent to the mill as bald as possible, otherwise the lint will absorb oil and the cake have a rough and unattractive appearance.

The lint has a market value, depending on its freedom from dust and pieces of seed hull and dirt, its length of fibre whiteness. Apart from the length of fibre, the quality of the lint produced depends on the efficiency of the cleaning and the method of removing it from the seed. It is impossible to remove the dust unless the long lint is opened out. If this could be accomplished the appearance of the lint finally obtained would be decidedly improved. The problem has in the past received much attention, but the tendency now is towards more intensive ginning and, consequently, less lint on the seed.

The removal of the lint or short fibre from the seed is accomplished in a variety of ways. For the removal of the long lint a modified form of saw gin is in general use. The Carver linter is representative of this type. The removal of the short fibre is effected by passing the seed between carborundum rolls. There are also machines of the defibrating type in which the short fibre is torn from the seed by the abrasive action of metal surfaces formed like a household grater.

In England cotton seed, having been cleaned and delinted, is sent to the mill and the oil extracted on the undecorticated system, that is, the entire seed, hulls and kernels pass through the presses. In America, where the seed is decorticated, the hulls being separated from the kernels (or meats), the meats only pass into the mill to be pressed. Much has been said and written in order to induce English crushers of cotton seed to introduce the decorticating system into their mills. Among the advantages claimed for the system, the following appear to be the most important:—

1. It obtains a higher yield of oil.
2. The oil is of better quality than that produced from undecorticated seed.
3. The oil is refined more easily and with less loss.
4. The cake is a highly concentrated cattle food, more easily digested than the undecorticated cake.

Regarding the cake, the relative merits of decorticated and undecorticated cake as a food for English cattle are still a matter of controversy.

The subsequent operations for reducing, milling, cooking and pressing the seed are interdependent, and any attempt to isolate one of them so that it does not fulfil its functions in meeting the requirements of the others is soon apparent. The effect is, of course, more marked on certain seed. The effect is also cumulative—for instance, unsatisfactory milling may be the cause of imperfect cooking, resulting in excessive "foots" at the presses. In practical seed crushing there is no such thing as efficient reducing, milling or cooking considered independently; the only efficiency of any use is their combined efficiency. The introduction of rich oil seeds and the demands for crude edible oils revolutionised oil milling. Methods in vogue for the extraction of oil from cotton seed, linseed, rape and other small seeds were found to be unsuitable when applied to palm kernels, groundnuts, and copra. It was found that these latter required much more intensive methods, and heavier finishing rolls and presses were introduced.

Extraction of Oils by Means of Solvents

After dealing with the features of the Anglo and heavy cage types of press, and the nature of the cakes produced, the author went on to consider the method of extracting oil by the solvent method. When this system of extraction was introduced, one of the most difficult problems which had to be solved was the disposal of the residue, which in the form of meal contained much less oil than the standard cake made from similar seed. The increasing demand for compound feeding stuffs solved the problem—the solvent plant meal became a recognised ingredient in the manufacture of sweetened meats, compound cakes, cubes, etc. At first it was used very sparingly, owing to the prejudice against its use on account of low oil content and frequent trace of solvent. Improved methods and the use of more suitable solvents facilitated the production of solvent-free meal, and the value and use of a low oil content ingredient for the compound mix is now fully appreciated.

The solvent system has developed rapidly since the war. There are now several plants each dealing with close on 1500

tons of seed per week. Undoubtedly (allowing for wage fluctuations common to both systems) the cost of extraction by the solvent method has been considerably reduced during the past few years. This has been brought about by increased production per unit (usually considered as 4 pots) reduced solvent losses, cheaper solvent and less consumption of steam.

Owing to the fact that the system lends itself to increased output without labour interference, there is every incentive to a still further increase per plant unit.

For the production of crude edible oil, the question of a suitable solvent is important. It has been proved by experience that for the higher quality oils, the solvent must comply with certain definite requirements. The unsatisfactory solvent and crude distilling plants used in the early days did much to retard the progress of this system of oil extraction.

For the extraction of oil from seeds a solvent should contain no traces of any compound capable of undergoing chemical change during the extraction process. It should have a close range of distillation, not too low to encourage loss, nor so high as to require a final temperature of evaporation injurious to the oil. It should not be soluble in water and it should have a distinctly different gravity from water.

For general suitability there has up to quite recently been nothing comparable to the specially prepared petroleum spirit. It has a satisfactory boiling point, and a sufficient close range to place it on an equivalent with the constant boiling solvent. Further, the standard grade which has been proved to be suitable for the extraction of edible oils can be obtained at a reasonable price. Unfortunately, it is inflammable, and its use adds considerably to the insurance charge on plants and buildings, especially in a congested district, and owing to the special precautions which have to be taken in the arrangement of artificial lights it is difficult to obtain good plant illumination.

Within recent time, trichlorethylene has come into prominence, for the extraction of oil from seeds, and it would now appear to be conclusively proved that, in addition to being non-inflammable, it possesses in use the following advantages compared with petroleum spirit :—

It has greater penetration.
Less solvent losses.
Increased production per plant unit.
Lower steam consumption for evaporation.

Regarding the use of this solvent for the production of edible oils, there is considerable difference of opinion as to its suitability ; this can only be decided when the solvent comes into more extended use.

The high cost of trichlorethylene compared with that of benzene is against it coming into rapid general use for oil seeds. The cost of solvent with plants using benzene is not now such a serious matter as formerly, when losses were anything up to 7 gallons per ton of seed ; and solvent at 2s. 6d. per gallon. The modern plant with a solvent loss of 3 gallons (benzene) per ton of seed and obtaining solvent at 1s. 6d. per gallon is not likely, on the face of it, to look very favourably on trichlorethylene at 5s. 3d. per gallon. To arrive at a fair comparison the conditions appertaining to the particular plant likely to use it must be taken into account. Further, in order to make perfectly sure that full benefit may be derived from the higher working efficiency of trichlorethylene, the capacity of the plant details must be checked.

Discussion

Professor Hinchley opened the discussion on the paper, which dealt with, he said, a subject full of scientific and chemical engineering problems. Mr. J. W. Austin, of the American Institute of Chemical Engineers, touched upon the difficulties met in the U.S. with the solvent process owing to the drier climate and the greater heat in summer, which hindered condensation of the solvent. The question of the decomposition of trichlorethylene was also discussed, and it was stated by Mr. J. Savage, of the Western Chemical Co., that this was caused not by moisture but by the action of light. The opinion was generally expressed that this solvent would prove very useful ultimately.

Fire Bars for Lancashire Boilers

A CORRESPONDENT asks whether it is possible to make, at a reasonable cost, fire bars for Lancashire boilers which would not burn out if submitted to heat which pertains in the middle of the boiler fire ?

Silicate Treatment for Roads

ONE of the best examples of the great value to the community of systematic chemical research is that of the after treatment of concrete with a dilute solution of silicate of soda, especially from the point of view of the hardening of concrete roads. It will be remembered that modern motor traffic is of quite recent growth, having only commenced about 20 years ago.

In 1904–1905 the total cost of the upkeep of the roads of Great Britain was £13,500,000. To-day this figure has actually increased to over £40,000,000, being, for example, in 1920–1921, £38,000,000. It is, of course, the heavier motor traffic that is the main cause of the trouble, and the requirements of the Road Department for a modern road, allowing for some considerable time ahead, are based on a 20-ton motor vehicle drawing three 13-ton trailers, with 50 per cent. added to allow for impact. It is obvious that most of the roads of the country are unsuitable for these new conditions and new methods of construction will have to be adopted. By long continued research work the action of silicate of soda on concrete has now been so thoroughly elucidated that obviously the road of the future is concrete, prepared under special conditions, and hardened with silicate of soda. One firm prominent in this work in Great Britain is Brunner, Mond and Co., who have just issued a new publication, *Concrete Roads : Treatment with silicate of soda*, which may be obtained on application to their head office, Northwich, Cheshire. This contains some remarkable photographs showing the great reduction in the wear and tear of concrete roads after treatment with silicate, and there is no question of the beneficial effects provided the right methods are adopted. The net result of the treatment carried out on the right lines is that the outer layer of the concrete becomes intensely hard and dense, with all the pores filled up, so that the road possesses a much greater resistance to abrasion and general wear and tear, whilst the surface is rendered no more slippery than before.

Death of Professor Frank Clowes

THE death occurred on Tuesday of Professor Frank Clowes, D.Sc., F.I.C., F.C.S., at his residence in Dulwich, aged 75. Educated at the Royal School of Mines, the Royal College of Science in Dublin, and the University of Würzburg, Professor Clowes took the degree of D.Sc. of London University. He was appointed in 1881 Professor of Chemistry at University College, Nottingham, and held the chair till 1897, being also the first Principal of the college. From 1897 to 1913 he was Chemical Adviser to the London Council and Director of the Council's staff and laboratories, and had since been expert adviser in gas supply to the Corporation of London. He was a past president of the Society of Chemical Industry, twice vice-president of the Institute of Chemistry, and twice vice-president of the Chemical Section of the British Association at the meetings of 1893 and 1914. He was the author of various contributions to analytical chemistry, including text-books which have gone through many editions and have become standard works. He also published the results of his researches in the experimental bacterial treatment of London sewage and in the detection and estimation of inflammable gases and vapours in the air. He contributed many original papers to the Royal Society, the Royal Institute of British Architects, and the societies in which he held office.

Red Stains on Brass

THE cause of red stains on brass has been the subject of research work at the Birmingham University. Mr. E. A. Bolton reported, in a paper before the Birmingham Metallurgical Society on Thursday, December 13, the effects of segregation, the action of saline and acid deposits from the pickling solution and impure washing water, the influence of various qualities of rolling oils, the effect of iron and the effect of furnace gases. Mr. Bolton said he was fully persuaded that the most important cause of staining lay in the use of old-fashioned furnaces in which the flames had direct access to the metal. Red staining was seldom present before the pickling operation ; it was formed as the result of reactions between the copper oxides in the scale and the pickling acid. Cupric oxide was as harmful as cuprous oxide. The mechanism of red staining consisted, he said, in the formation, during the annealing, of oxides of copper ; the actual stain was formed later in the pickling operation.

Activity of Rubber Vulcanising Accelerators

Papers Before Manchester Societies

A JOINT meeting of the Manchester Sections of the Society of Chemical Industry and the Institution of Rubber Industry was held at the Textile Institute on Friday, December 7. Dr. H. Levinstein presided, and Mr. J. H. Mandleberg, A.I.C., Chairman of the Manchester Section of the Institution of Rubber Industry, was also present. A Paper, entitled "Methods to be Adopted in Comparing Activity of Various Accelerators," was read by Mr. G. Martin, Superintendent of Rubber Investigations, Imperial Institute.

Mr. Martin said that the manufacturer was so accustomed to blame the rubber whenever trouble occurred in the factory that it might be advisable to emphasise that the remedy might be in his own hands. More variable than the rubber was the latex from which it was prepared. The work of the Ceylon Rubber Research Scheme showed that the methods adopted on the plantations tended to eliminate these variations. Although the by-products of rubber latex in some cases became valuable compounding ingredients, the most rational method of preparation seemed to be one in which these by-products were eliminated as much as was consistent with the stability of the caoutchouc. Those by-products of the latex which improved the ageing of the vulcanised rubber determined its time of cure, helped to fix its plasticity and improved its physical properties in the presence of organic accelerators should be replaced by the manufacturer with definite quantities of substances of known composition, which would bring about the exact changes desired. We were not sufficiently enlightened to do all this at present, but it was the ideal to aim at. Developments, however, were taking place in an entirely different direction. In some quarters of the rubber industry there was a vogue for including all the latex by-products in the rubber—varying in nature and quantity and so causing variation in the properties of the rubber. This form of rubber might hold a place for a time, but eventually, as the art of compounding became scientifically developed, it seemed probable that this rubber would have to give way to the purer rubber, which could be modified by the manufacturer with the complications introduced by the presence of indefinite natural products reduced to a minimum.

Accelerators

It was evident that the potency of an accelerator was affected by the purity of the rubber, and that the results of physical measurements may differ considerably from the results of chemical measurements of the extent and therefore of the rate of vulcanisation. Some investigators have made use of an acceleration factor as follows :—

$$k = \frac{Sa}{Sr}$$

Where "k" is the acceleration factor, Sa is the rate of vulcanisation in the presence of the accelerator. Sr is the rate of vulcanisation in the same mixing in the absence of the accelerator. To avoid the complications connected with the difference between physical and chemical measurements of rate of cure, Sa and Sr are regarded as referring to the rate of combination of rubber and sulphur and not to the physical effects produced.

Such an acceleration factor was useful as long as its limitations and approximations were understood. It was dependent upon the ratio of two values, both of which were affected by the raw rubber used and not always in the same direction. As already stated, the value of Sa in a mix containing equal quantities by weight of rubber and zinc oxide might vary by 50 per cent. It was well known that the value of Sr might vary by still greater amount unless a particular form of rubber was always used. The raw rubber might therefore be responsible for a distinct variation in the value found for the acceleration factor. The greater the acceleration factor the less serious was the variation.

Concentration

If the concentration of the accelerator was doubled, it was generally realised that the acceleration factor was not now 2k, but a value somewhat less than this. In other words, the combination of rubber and sulphur was not doubled. The acceleration factor for aldehyde ammonia in the rubber, sulphur mix (90 : 10), has been shown by Twiss and Brazier to be increased by 76 per cent., 66 per cent. and 50 per cent. respectively on repeatedly doubling the concentration of the accelerator. The authors mention that the vaporisation of the aldehyde ammonia during mixing probably had an influence on the results. In the following table, compiled from work done at the Imperial Institute, is shown the percentage increase in the potency of an accelerator obtained by doubling its concentration in a mixing containing equal quantities by weight of rubber and zinc oxide.

TABLE I.

Mix : 90 rubber, 90 zinc oxide. Temperature 141° C.

	10 sulphur	7½ sulphur	5 sulphur
Aldehyde ammonia	33	25	25
Hexamine	30 29	31 35	—
Suparac	25	31	32
p-Phenylene diamine	—	31	30
Accelerene	—	38	—

Owing to the curvilinear course of the rate of combination of rubber and sulphur during the early stages of vulcanisation the figures could only be regarded as approximate. Moreover, a small error in mixing or curing, causing an error amounting to only 1 per cent. of the total amount of combined sulphur, would raise or lower the figures shown in the table by three units. The results indicated that the increased potency of the above accelerators on doubling their concentration was fairly uniform. Confirmation of this conclusion was not obtained in the presence of still smaller quantities of sulphur. It followed that if a given quantity of accelerator A was found to enable sulphur to combine with rubber 30 per cent. more quickly than the same quantity of accelerator B under the conditions observed above, then half the quantity of accelerator A has the same potency as accelerator B. The results suggest that it may be possible to obtain an accelerator constant which was independent of the accelerator concentration.

In the absence of more detailed experiments on the effect of increasing the concentration of the accelerator and to avoid the setting up of new standards, it was advisable at present to retain the now well-known acceleration factor and to use it in connection with a concentration of 1·0 per cent. accelerator only. In the case of experiments where more or less than 1 per cent of accelerator was used, a single calculation would give the acceleration factor for 1 per cent. concentration, and this could be checked, if considered necessary, by actual experiment.

The potency of an accelerator was affected by the concentration of the sulphur. This was true whether the rubber contained the natural accelerators only or also contained an added artificial accelerator. According to the figures of Fol and van Heurn the rate of combination of rubber and sulphur in a rubber-sulphur mix was nearly proportional to the amount of sulphur present. The following table shows the variation in the acceleration factor of different accelerators in the presence of varying amounts of sulphur. The acceleration factor is recalculated in terms of 1 per cent. concentration of accelerator, and it is assumed that the rate of combination of rubber and sulphur, in the absence of the added accelerator, is directly proportional to the concentration of the sulphur.

TABLE II.

Accelerator	Accelerator Concentration per cent.	Sulphur Concentration per cent.	Combination rubber and sulphur per minute per cent.	Acceleration factor $K = \frac{Sa}{SrA}$
Hexamethylene tetramine	1·11	11·11	0·0925	3·0
		8·33	0·0738	3·2
		5·56	0·0427	2·7
		3·33	0·0256	2·7
Aldehyde ammonia	1·11	11·11	0·0895	2·9
		8·33	0·0805	3·5
		5·56	0·0595	3·8
		3·33	0·0222	2·3
p-Phenylene diamine	1·11	8·33	0·0590	2·5
		5·56	0·0400	2·5
		3·33	0·0228	2·4
Thiocarbanilide	4·44	8·33	0·0846	1·8
		5·56	0·0706	2·2
		3·33	0·0260	1·6
Ultra accelerator	1·00	11·11	2·000	67
Natural accelerator	1·00	11·11	0·030	1

It will be noted, in the case of the four accelerators mentioned in the Table, that accelerator activity was at a minimum per unit of sulphur present in the case of the lowest concentration, and at a maximum between 5 and 8 per cent. of sulphur.

Specific Surface

The effect on vulcanisation of differing degrees of fineness of the zinc oxide was known to be considerable in the absence of an added artificial accelerator, but in the presence of an added organic accelerator the effect was not so marked. Very little work on this subject has been published, and therefore it was not proposed to go into further details.

Temperature

In connection with the effect of temperature on the rate of vulcanisation Twiss and his collaborators state: "The fact that the temperature coefficient possesses comparable values for mixings with and without an artificial catalyst appears . . . to be a general one for all catalysts." In the case of a mix containing piperidinium pentamethylene dithiocarbamate the same authors state: "These figures indicate that for a mixture containing sufficient zinc oxide a fall of 10° C. in the temperature necessitates a period of vulcanisation 2 to 2½ times as long; the value is comparable with that found for the temperature coefficient of vulcanisation of simple mixtures containing simple accelerators. . . ."

Conclusion

It has been shown that the acceleration factor was not strictly constant under simple alterations of conditions. The variations in value, however, were not of sufficient magnitude to prevent the factor from being useful, especially for the purpose of commercial description. It was advisable to retain the acceleration factor for 1 per cent. concentration of the accelerator in the rubber, and to give the conditions under which it had been determined. Physical methods of measuring the rate of cure give larger values for the acceleration factor than the chemical method. The two sets of values, however, appeared to be interrelated.

A second paper, entitled "The Analysis of Organic Rubber Vulcanising Accelerators," by T. Callan, M.Sc., Ph.D., and N. Strafford, B.Sc., A.I.C., was read by Dr. Callan. In this paper, the authors put forward methods for the identification and quantitative determination of a number of the more widely used organic accelerators, including phenolic, nitriso and amino compounds, the aryl guanidines, such as diphenylguanidine and triphenylguanidine, the biguanides, such as *o*-tolylbiguanide, thiocarbanilide and the substituted thiocarbanilides prepared from amines other than aniline, *e.g.*, toluidine, aldehyde ammonia, the derivatives of dithiocarbamic acid, such as zinc diethyldithiocarbamate, diethylammonium diethyldithiocarbamate, piperidine piperidyl dithiocarbamate, and their oxidation products, the thiuram disulphides. Most of the methods put forward involve simple volumetric determinations using ordinary standard solutions. The authors have also determined the physical constants, *e.g.*, melting point, solubility, etc., of a number of purified compounds and their derivatives used as accelerators, such data being of considerable value in elucidating the composition of an accelerator requiring to be identified.

Liquid Oxygen Used in Blasting

Liquid oxygen explosive has been successfully used in Colorado by the Department of the Interior in experimental mine blasting and road construction work at a cost of approximately one-half that of the gelatin dynamite required to do the same work. The experiments were conducted by E. D. Gardner, mining engineer of the Bureau of Mines, in cooperation with a representative of the Compressed Air Corporation.

A liquid oxygen explosive consists of gas black, wood pulp or some other carbonaceous material made up into cartridges and soaked in liquid oxygen. This explosive can be detonate dsimilarly to ordinary dynamite with cap and fuse or with electric detonators.

The liquid oxygen was obtained from a plant designed to furnish oxygen gas and was shipped to the point of use in dewar flasks, which are made on the same principle as thermos bottles.

Chemical Trade in November

Increased Exports and Imports

As announced last week, the Board of Trade returns for November show the following totals: Imports, £101,584,990, increase on 1922 of £6,028,338; exports, £65,768,155, decrease on 1922 of £722,629. In chemicals, drugs, dyes, and colours the returns show an increase in value both in exports and imports. The total value of exports was £2,014,741, an increase of £138,672 on 1922: and a decrease of £558,140 on October of this year. The total value of imports was £1,138,282, an increase of £70,196 on November, 1922, and a decrease of £107,634 on October, 1923.

An examination of the detailed figures given below shows a very largely increased import of borax, and satisfactory figures for potash salts and calcium carbide. The imports of bleaching materials, sodium nitrate, and red and orange lead are lower than last year, but otherwise the changes are only fractional. Very satisfactory improvements in exports are sulphate of ammonia, sulphuric acid, tartaric acid, benzol, naphtha, and coal tar crudes, potash salts, and synthetic coal tar dyestuffs.

Imports for November

Increases.		1923	1922
Acid, acetic	tons	630	582
Borax	cwt.	9,320	4,040
Calcium carbide	,,	100,544	82,301
Glycerin, crude	,,	1,139	868
Glycerin, distilled	,,	333	245
Nickel oxide	,,	1,873	—
Potassium nitrate	,,	14,459	8,401
Potassium compounds, except nitrate	,,	508,137	458,933
Cream of tartar	,,	3,059	2,227
Zinc oxide	tons	628	588
Indigo, synthetic	cwt.	21	—
Indigo, natural	,,	56	49
Barytes, including blanc fixe	,,	51,560	48,437
White lead	,,	11,942	11,188
Painters' colours, unspecified	,,	66,122	42,685
Mercury	,,	131,298	130,457
Decreases.		1923	1922
Acid, tartaric, including tartrates	cwt.	999	1,049
Bleaching materials	,,	1,445	3,099
Red lead and orange lead	,,	3,822	2,992
Sodium nitrate	,,	110,629	179,084
Sodium compounds, except nitrate	,,	22,008	23,487
Intermediate coal tar products, including aniline oil, and salt, and phenyl glycine	,,	10	24
Alizarine dyestuffs	,,	222	384
Unspecified coal tar dyestuffs	,,	2,444	6,581
Essential oils other than turpentine	lb.	317,768	338,202
Turpentine	,,	39,097	61,911

Exports for November

Increases.		1923	1922
Acid, sulphuric	cwt.	1,515	1,076
Acid, tartaric, including tartrates	,,	2,901	1,098
Ammonium chloride	tons	479	456
Ammonium sulphate	,,	19,005	14,058
Anthracene	cwt.	248	—
Benzol and tuluol	galls.	214,830	5,427
Carbolic acid	cwt.	10,848	10,000
Naphtha	galls.	103,791	5,949
Naphthalene	cwt.	18,281	9,927
Unspecified coal tar products	,,	30,375	27,034
Crude glycerin	,,	4,217	2,991
Potassium chromate and bichromate	,,	4,200	2,191
Potassium nitrate (saltpetre), British prepared	,,	1,165	910
Other potassium compounds	,,	2,065	1,925
Sodium carbonate, etc.	,,	486,743	437,478
Caustic soda	,,	149,972	121,728
Zinc oxide	,,	273	222
Coal tar dyestuffs	,,	12,915	4,561
Unspecified dyestuffs	,,	8,521	7,924
Paints, etc., ground in oil or water	,,	30,372	29,823
Paints, etc., prepared	,,	27,604	20,566
Paints, etc., unspecified	,,	47,763	55,298
Decreases.			
Bleaching powder	cwt.	16,482	25,484
Tar oil, creosote, etc.	galls.	1,561,826	2,938,137
Copper sulphate	tons	585	2,282
Glycerin, distilled	cwt.	12,045	14,021
Sodium chromate and bichromate	,,	2,932	4,692
Sodium sulphate, including saltcake	,,	97,944	174,726
Unspecified sodium compounds	,,	48,911	49,425
Barytes, including blanc fixe	,,	280	5,076
White lead	,,	14,604	14,897

Midland Chemists at Dinner

Relations between Institute and B.A.C.

THERE was a large and representative attendance of Midland chemists on Saturday at Birmingham at the joint annual dinner of the Birmingham and Midland Sections of the Society of Chemical Industry and the Institute of Chemistry. Professor G. T. Morgan, head of the Chemistry Department of the University of Birmingham (and Chairman of the Birmingham and Midland Section of the Institute), presided over a representative attendance. Professor F. W. Burstall, head of the Mechanical Engineering Department and Dean of the Faculty of Science, Birmingham University, and Dr. E. B. Maxted (chairman of the Midland Section of the Society of Chemical Industry), who respectively were to have proposed and responded to the toast "The Society of Chemical Industry," and Professor Ling (Brewing Department, Birmingham University) were absent through indisposition. Dr. E. F. Armstrong (President of the Society of Chemical Industry) and Mr. Woolcock (manager of the Association of British Chemical Manufacturers) also wrote apologising for absence.

Mr. H. B. Jacks (Metallurgical Society) proposed the toast "The Society of Chemical Industry" and referred to the great and increasing part played by chemistry in the study of metallurgy. The closer alliance of science and industry was one of the most encouraging of modern developments.

Mr. O'Shaughnessy (Consulting Chemist to the Birmingham, Tame and Rea Drainage Board), in responding, pointed out that in the halcyon days of the Midland Section of the Society of Chemical Industry many valuable contributions on various phases of metallurgical science were made, thus adding to our chemical knowledge and concurrently increasing the status and prestige of the Midland Branch. "It has been stated," added Mr. O'Shaughnessy, "that every industry nowadays is practically a chemical industry. It is certainly no exaggeration to say—and those who are engaged on the chemical side in industrial operations and are able to appreciate the drift and extent of comparatively recent progress will I think agree—that the modern industrial tendency is wholly in that direction. Even in the metallurgical industries in this country chemistry has something to say with regard to their welfare."

Further Co-operation Proposals

Dr. H. Levinstein, in proposing the toast "The Institute of Chemistry," reminded them that he was recently in Birmingham in connection with the annual business meeting of the British Association of Chemists, of which he was President, and in a letter he received from one gentleman, a personal friend, he was described as "the Arch-Bolsh of the Bolshevic movement in chemistry." (Laughter.) It was clear he was entirely misunderstood for, really, he was quite a good Conservative. He thought the British Association of Chemists, which was very democratic, was doing an excellent work; certainly, it had rendered admirable service in that it had aroused the Institute from a prolonged slumber to visible signs of activity in unexpected directions. (Hear, hear.) As a result the Institute was stronger, more prosperous, and more representative of chemists than ever before, and certainly it spoke with greater authority. He attributed this progress largely to the stimulus which had been given by other bodies, and particularly by the B.A.C. The Institute of Chemistry was going ahead; it set an ideal to which chemists would have to conform and a standard of professional qualifications to which chemists would have to attain before they could be considered accredited members of one of the greatest professions of the day.

Birmingham, continued Dr. Levinstein, was to-day one of the greatest centres of chemistry—and one of the great centres of the Institute—and he felt that the progress it had made was due very largely to the distinguished Professor of Chemistry at the Birmingham University, Dr. Morgan. It had been his business lately to try to acquire some elementary knowledge, always a most painful proceeding, of what had been done in the various chemical schools of this country in the last 20 or 30 years, and one of the most striking developments had been made in Birmingham, which a few years ago—he thought he could say so bluntly—was without a large and important school in the sense it was to-day. (Applause.) In the great enthusiasm for research, in the volume of research turned out, in the quality and in the number of students, Birmingham was not far behind, if at all, any chemical school in this country or elsewhere. One of the things he always thought of with regret, particularly when one was talking closely about the Institute of Chemistry, was that there was not quite as much correlation between the work of that great Institute and, for instance, the British Association of Chemists. The Institute, being a chartered institute, had special functions to perform and was debarred from carrying out the kind of work which the B.A.C. was established to do—namely, to look after the more material interests of chemists, and to do what was done in the medical profession by the Junior Medical Society. He would welcome a much closer connection from the administrative point of view, and he thought it would be a very desirable thing if the affairs of those two societies, which affected chemists so much, were administered from one office. "That is a thing," he added with emphasis, "which I would like to see taken in hand in the future." One of the great troubles in chemistry to-day was the very heavy expense to which chemists were put. He thought it most desirable that every chemist should, upon taking his degree and going out into the world, join some society.

In his reply, Professor Morgan observed that Dr. Levinstein had spoken of the lack of co-ordination, but he would point out that there was a composition fee of £3 for those who subscribed to the publications of two societies. Ultimately they might get a composition fee to include the Chemical Society, the Society of Chemical Industry, the Institute of Chemistry, and the British Association of Chemists.

Mr. W. A. S. Calder, proposing the toast "The Guests," referred to the value of university work from the view-point of industry, and Dr. Douglas Stanley (President of the Midland Medical Association) replied.

Recent Advances in Corrosion Study

Paper by Dr. Newton Friend

AT a meeting of the Hull Chemical and Engineering Society on Tuesday, December 11, Dr. J. Newton Friend, F.I.C., the President of the Oil and Colour Chemists' Association, presented a paper on "Recent Advances in the Study of Corrosion." There was a large attendance, and after an interesting discussion a vote of thanks was passed to Dr. Friend on the motion of Mr. G. F. Riordan, B.Sc., the principal of the Engineering Section of the Hull Municipal College.

In the course of his paper Dr. Newton Friend stated that although it had long been known that iron readily rusted upon exposure to the forces of nature, the subject had only become one of serious importance during the last fifty years. With the ever-increasing use of iron and steel for engineering and other commercial purposes, the problem of rust prevention was daily becoming more acute, and the need for further research on the subject could hardly be over-estimated. It was generally recognised that when iron (or steel), air, and liquid water were brought into contact, corrosion took place. The iron, by virtue of traces of impurity in itself, in the air, or in the water, passed into solution in minute quantities, which were renewed as rapidly as they were thrown out of solution in the form of rust. Thus, for example, carbon dioxide being one of the most prevalent impurities, the scheme in most cases would appear to be as follows:

(i) $Fe + 2H_2CO_3 = FeH_2(CO_3)_2 + 2H$
Soluble ferrous bicarbonate. Nascent hydrogen.

The nascent hydrogen readily combined with dissolved oxygen to form water. The remaining reactions proceeded as follows:

(ii) $FeH_2(CO_3)_2Aq = FeO.Aq + H_2CO_3$

(iii) $4FeO.Aq + O = 2Fe_2O_3.Aq.$
Rust.

The carbonic acid liberated in accordance with equation (ii) through the hydrolysis of ferrous bicarbonate, was free to attack more metal, and so the cycle continued.

There were, however, many phenomena attendant upon the corrosion of iron that could not be satisfactorily explained in the above manner, and it became evident that another supplementary theory was necessary. When a piece of iron was laid in a tube and water caused to flow over it, the first effect of

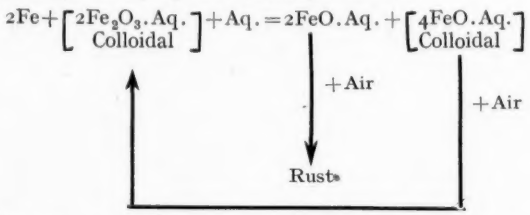
increasing the rate of flow was to enhance the corrosion of the metal. But a critical velocity was soon reached—namely, approximately one-tenth of a mile per hour, at which the corrosive effect attained a maximum, further increase in velocity resulting in a decrease of corrosion, until with a rate of flow of about four miles per hour corrosion ceased. The metal under these conditions lost only very slightly in weight, probably in consequence of direct solvent action coupled with mechanical erosion.

This interesting phenomenon could neither be anticipated nor explained by any recognised theory of corrosion. It appeared as if the moving water washed away from the surface of the metal something that was needful to induce corrosion. The author therefore suggested that:

1. On coming to contact with ordinary air and water, iron slowly dissolves in minute quantities, ultimately yielding ferrous hydroxide sol—that is, colloidal ferrous hydroxide.
2. This sol oxidises in excess of air to colloidal ferric hydroxide, Fe_2O_3Aq; in less favourable circumstances colloidal ferrosoferric hydroxide, Fe_3O_4 Aq. is produced.
3. This higher colloidal hydroxide now acts catalytically, accelerating the oxidation of the iron and simultaneously undergoing reduction to a lower colloidal hydroxide. It reoxidises as the air diffuses towards it, and the cycle continues.
4. Rust is formed when the colloidal hydroxide precipitates out or "flocculates."

In ordinary cases, therefore, corrosion might well proceed in two ways simultaneously—namely: (i) By direct solution—a process rendered possible by the presence of dissolved electrolytes. (ii) By catalysis, this reaction being superimposed on the other, the colloidal iron hydroxide functioning in the presence of air as the active catalyst.

In acid solution the former of these reactions took place almost exclusively. In neutral solution the second reaction played an important part. This colloidal theory might be represented briefly by the following scheme:



This theory enabled explanations to be offered for many interesting phenomena that were otherwise anomalous. Thus, for example, it was evident that any factor, whether mechanical, chemical or electrical, that was capable of destroying the colloidal forms of iron hydroxide would tend to retard corrosion. That was precisely what was found in practice to be the case. Experiment showed that the relative precipitating powers of chromates, sulphates, and chlorides upon ferric hydroxide sol were as follows:

Chromates and dichromates	100·0
Sulphates	67·0
Chlorides and nitrates	0·3

In other words, large quantities of nitrates and chlorides were required to precipitate the colloid, but only small quantities of chromates and dichromates, the sulphates lying intermediately. It was to be anticipated, therefore, that small quantities of chromates would inhibit corrosion. This is known to be the case, and the addition of chromates to boiler feed waters and to paints destined for the preservation of iron had frequently been recommended.

Another interesting phenomenon was the behaviour of iron towards radium rays, which usually tended to accelerate oxidation processes. If the corrosion of iron was purely an ionic effect, exposure to radium rays should lead to enhanced corrosion. On the other hand, the rays tended to precipitate colloidal iron hydroxide, and would, therefore, according to the colloidal theory, tend to retard corrosion. Experiment had shown that radium rays, springing from an exceedingly feeble source, exerted a decided retarding action upon the corrosion of iron.

Practice Under Modern Patent Law

What "Licences of Right" Mean

A JOINT meeting of the Leeds Area Section of the Institute of Chemistry and the Yorkshire Section of the Society of Chemical Industry was held at the Queen's Hotel, Leeds, on Thursday, December 13. Messrs. F. S. Brady, R. A. Mott and S. T. Saint were formally admitted associates of the Institute.

Mr. Griffith Brewer, in a paper on "Practice Under the Modern Patent Law," described how patentees were needlessly paying £140,000 every year in full-scale Government taxes, when they could with additional advantages save 50 per cent. on their payments. Under the Regulation introduced in 1919, a patentee might have his patent endorsed "Licences of Right," which had the effect of empowering the Comptroller of the Patent Office to intervene in the event of a patentee refusing to grant a licence on reasonable terms. The object kept in view was that the invention was used to the greatest extent, and that the patentee was rewarded adequately for his invention. Although this provision had been in force for nearly four years, and over 2,000 patents had been brought within the section, no compulsory "Licence of Right" had yet been granted against the will of the inventor. As an inducement for the patentee to be reasonable and have his patent endorsed in this way, the taxes payable on the patent were reduced to a half-scale. Thus, instead of a patentee paying £126 in renewal fees to the end of the term he paid £63 if the patent had been endorsed.

This, Mr. Griffith Brewer contended, must be welcome news to many patentees who might not have realised the possibility of saving £63 in addition to the advantage in many cases that offers to work the invention might be received merely because of the declaration of the patentee that he would not be unreasonable.

Licences of Right

Mr. Brewer drew attention to the fact that every patent had endorsed upon its face the full-scale of fees and a statement saying that the continuance of the patent was conditional on the payment of those full-scale fees. He suggested that this endorsement was misleading and should be corrected to conform to the new provisions of the Act, and to state plainly by adding a second column to the table showing the half-scale fees payable in respect of patents endorsed "Licences of Right." He believed that if, instead of merely publishing this information in the Act and in the Official Journal of Patents, (which not one patentee in a hundred ever saw), the information were given on the face of every patent, instead of two per cent. of patents granted being endorsed "Licences of Right," eighty per cent. at least would be thus endorsed.

It frequently happened in his experience that a patentee of an improvement desired to obtain a licence in respect to a patent of earlier date, but was afraid to approach the earlier patentee for fear of being refused a licence, and by the mere fact of having approached the earlier patentee, to have his notice drawn to the wish of the patentee of the improvement desiring to manufacture. In cases where the patent had not been endorsed "Licences of Right," the utmost caution had to be exercised in approaching the patentee, whereas if the patent had been endorsed, then the patentee of the improvement could approach the earlier patentee with greater confidence. In this way many inventions might be placed on the market which would otherwise miss their opportunity.

Sterilisation of Preserved Foods

MR. A. TROBRIDGE presided over a meeting of the Newcastle Section of the Society of Chemical Industry in Newcastle, on Wednesday, December 12, when Miss C. M. Dugdale, of the firm of Angus Watson and Co., Ltd., Newcastle, read a paper upon the laboratory work of the firm. Her address dealt with the sterilisation of preserved foods. Dr. H. Kerr, Medical Officer of Health for Newcastle, who took part in the discussion, emphasised the importance of heat penetration in the sterilisation of food. The use of preserved foods was very greatly on the increase, and chemicals were entering into the preservation process. Though such chemicals might be harmless in themselves, as was borax for example, the use of them in food was to be condemned, because the accumulation of small doses in the course of a day was distinctly bad for invalids and for children. The use of copper sulphate for greening peas was absolutely reprehensible because it was distinctly poisonous.

Mustard Gas Claim

Evidence by Dr. Levinstein and Professor Green

DR. HERBERT LEVINSTEIN gave further evidence on Monday when the hearing of the claim made by him and Professor A. G. Green in regard to the invention of a mustard gas process was resumed by the Royal Commission on Awards to Inventors at the Law Courts, London. The claimants' contention is that they first discovered a method of producing mustard gas on a large scale without danger to the workpeople, and that the Ministry of Munitions adopted this method after many unsuccessful experiments at their own works.

Dr. Levinstein was cross-examined at considerable length by Mr. Hunter-Gray, for the Crown, on the point whether the claimants' mustard gas was different from that of Professor Pope.

"Our process is, in my opinion, entirely new," said Dr. Levinstein. He disputed the suggestion that his product was old by reason of the work of Professor Pope in 1916.

Mr. Gray described an experiment in detail, and asked what it would produce.

Dr. Levinstein: You would produce a casualty. (Laughter.)

Experiments, said Dr. Levinstein, were first carried out under his direction at the works of the British Dyestuffs Corporation at Blackley, Manchester, in April, 1918, and in May they had decided what process to adopt. At the end of May Professor Pope and Professor Gibson, who had also been carrying out experiments, visited the Blackley Works.

Mr. Hunter-Gray: They went to give you such information as you required?

The witness: Nothing of the kind.

Do you say that they came to be taught by you and Professor Green?—I do.

Professor Gibson says he came to give you assistance, which you very much required. You won't accept that?—No. I won't.

Did Professor Pope also call to get as much information as possible?—Certainly.

Mr. Gray remarked that he would call Professor Pope, and he would deny that he came for information at all.

Two Processes

"I was confronted," said Dr. Levinstein, "with a process which was not feasible in my opinion on a large scale. Professor Green produced another process which I thought was feasible. I have never troubled myself with particular details. One process was safe and could be carried out, and the other, in my judgment, could not."

His process, he mentioned, involved the violent agitation of the chemicals by stirring them at 2,500 revolutions a minute. Another method which was described would, he believed, produce more casualties than mustard gas.

Mr. Gray: Were the casualties at the works at Blackley so numerous that the record of them, which was kept in the first instance, was relinquished?

The witness: I should say that statement was entirely untrue.

It is suggested that never a day passed without a casualty?—I should say it is entirely inaccurate. I do not think we had any casualties before the accident when an explosion occurred.

Would the first-aid supervisor of the mustard gas department of the works be right if he says that after the first fortnight the plant was continuously going wrong?—It is only his opinion as to the working of the plant, and it is not of much value.

Would he be wrong in saying there were many cases of gassing and of blood poisoning?—My recollection is that there were no casualties at all until the accident.

Was there one occasion when only one man out of a staff of a hundred turned up to work?—There never were a hundred on the staff or anything like it. I think there were about three, and perhaps only one out of the three turned up.

Were there deaths?—There was one death which I think was caused by mustard gas. It was the case of a man who was subject to bronchitis and had a dose of mustard gas which proved fatal.

Professor Green

Professor A. G. Green, formerly Professor of Colour Chemistry and Dyeing at Leeds University, and Director of Research with the British Dyestuffs Corporation, described the experiments that he had carried out in order to find a satisfactory method of production. In his opinion the Pope process was not practicable. When the witness spoke to Professor Pope about the results he had obtained, the Professor was distinctly sceptical about it, and his collaborator, Professor Gibson, came to the witness's laboratory at Blackley to investigate the results.

The witness denied that Professor Gibson was sent down to teach them. Professor Pope also visited the laboratory, but would not entirely accept the results. A sample was, however, favourably reported upon by the Chemical Warfare Committee. Professor Gibson himself explained his visit by saying that the Government had requested him to introduce the Blackley product at Avonmouth. The witness knew nothing about Professor Pope's patent until nearly two years after the war, and it came rather as a shock to him.

The hearing was adjourned.

Society of Glass Technology

Standard Glass Specifications and Other Matters

THE question of taking steps to draw up specifications for the manufacture of glass has long been engaging the attention of the Council of the Society of Glass Technology, and the particular problem of specifications for soda-lime glasses for containers has already been discussed this year. This matter was again brought up at the meeting of the Society at University College, London, on Wednesday, December 12, when it was introduced by Professor W. E. S. Turner, the President of the Society.

Professor Turner, referring specially to soda-lime glass articles in general use, said that the two main points of such specifications would have to be durability and satisfactory annealing. Each glass would have to have special characteristics, the importance of which would vary according to the use to which the article would be put. Perhaps he could illustrate best what he meant by referring to four types of glass container. (1) Medicine bottles; (2) beer and spirit bottles; (3) jam jars; and (4) potted meat jars.

Medicine bottles did not require to be heated. The two essentials in this case were that the bottles should not be acted upon by the solution placed in them, and they should be reasonably durable. On the other hand, the prescription or solution put into the bottle should not be acted upon by the glass. A test had been outlined recently by using a solution of narcotine hydrochloride, and he suggested that that test was a perfectly satisfactory one for the ordinary medicine bottle. Then, of course, there would have to be satisfactory annealing. In the case of beer bottles, the question of durability came in and also that the beer or spirit must not be acted upon by the glass. He had known of cases in which whisky had been absolutely decolourised by the action of the glass. In the case of beer, some of it, but not much, was pasteurised, and that would represent one special type of requirement, because in such a case it was necessary to know how that type of bottle would withstand the action of pressure and temperature in conjunction.

Conditions of Durability of Jam Jars

With jam jars, the question of durability was most important, and one reason was that it had been found that if jam jars were stocked for any length of time, the durability suffered. A white film was found to have developed in the glass and a great deal of work had been done with the object of removing that white film. His own view was that the proper process was not to try and remove that white film but to try and manufacture good glass. A special feature in connection with jam jars was ability to withstand temperature. They were filled with hot jam, and were usually first washed in luke-warm water. The temperature at which the jam was filled was somewhere about 180° to 210° F.

In his full paper, already published, he had tried to make some suggestions as to how these various conditions could be met by specification. The actual composition of the glass mattered less than did the acquisition of the necessary properties and their retention in the glass article. He made the suggestion that no glass article to be used as a container should have a composition of more than 18 per cent. of sodium oxide or less than 8 per cent. of calcium oxide and alumina. These

he suggested as the lowest limits. The alkali was the worst feature from many points of view. It was a great advantage in the melting of the glass, but it was a great disadvantage in regard to the subsequent properties of the glass itself, and he therefore suggested that if manufacturers adopted about 16 per cent. sodium oxide, and something in the neighbourhood of 10 per cent. calcium oxide, they would do very much better. Until agreement was reached, however, the figures of 18 per cent. sodium oxide and 8 per cent. calcium oxide were put forward as a working basis. The Association itself might think of drafting specifications for the purpose, but before attempting to do that it was thought best that the matter should be thoroughly discussed by the members of the Society.

A discussion followed, largely dealing with the methods of testing jam jars. It was suggested by Mr. F. W. Adams that a steam jet had many advantages over the various hot water tests, and that it might be advisable to get out some broad specification on the lines of what had been said by the various speakers and put that before the Society for discussion at a later date. The matter was so important that some agreement should be come to whereby doubtful glasses should be considered and people warned about them.

Mr. Code-Pryor endorsed the suggestion that a memorandum should be drawn up and brought before the Society. The object of specifications should be to protect the glass manufacturer from the unscrupulous glass manufacturer, and if a specification were framed sufficiently loosely and with due caution this danger could be guarded against.

The President, in summing up, said that in his opinion the issue of specifications would be of the greatest possible benefit.

It was the view of the Council that the matter should be brought up again at another meeting.

Factors in Industrial Fatigue

At the same meeting Mr. Eric Farmer, of the Industrial Fatigue Research Board, dealt with a research which he carried out for the Board and the Glass Research Association in a paper entitled "Some Factors Affecting Efficiency in the Glass Trade." The author showed that under identical conditions in every way the output per hour per man in a glass factory was higher under the 8-hour shift system than under the 10-hour system. It was also shown that output declined towards the end of the working week and was lowest in the morning shift with the three-shift system.

A paper was also presented by Mr. Verney Stott describing "An Apparatus for Calibrating Burette Tubes." The method of calibration used was that of transferring successive quantities of water from the blank burette tube to a standard pipette. A piece of thermometer tubing was attached to the top of the burette tube by means of two pieces of rubber tubing and an adaptor. The thermometer tubing controlled the rate at which air entered the top of the burette tube and therefore controlled the rate of outflow of water from the burette tube. The pointing marks were made by folding a piece of black paper round the burette tube and fastening it with seccotine so that the top edge of the strip coincided with the bottom of the water meniscus.

British Empire Exhibition Fellowship

A FELLOWSHIP has been formed in connection with next year's British Empire Exhibition, with the Prince of Wales as President and first member. In accepting the Presidency, the Prince has addressed a letter to the Duke of Devonshire, in which he says:—

"I am very glad to accept the invitation to become the first Member and President of the Fellowship of the British Empire Exhibition. I think that there will be many thousands of people throughout the Empire who will wish that the Exhibition, apart from its general work of furthering Imperial trade and industry, should undertake some definite tasks in promoting knowledge of the Empire and in assisting to a better distribution of the Empire's population. I think also that they will wish to do something more for the success of the Exhibition than to visit it once or twice. The Fellowship, with its programme of Imperial Education, its scheme of Settlement Scholarships, and its provision of Season Tickets to the Exhibition, is intended to meet these cases. I wish the Fellowship a great success, and I hope to see its membership grow in every part of the Empire."

Re-arrangement of the Science Museum

Protest Against Inadequate Accommodation

THE Western Galleries of the Science Museum, South Kensington, which for nearly half a century have contained the valuable Science Collections of the Museum, were closed to the public on September 17. These galleries have now been vacated, and the constructional and other work (gun foundations, redecoration, etc.) considered by the Government to be necessary to make the galleries fit to house the collections and staff of the Imperial War Museum (created a few years ago, and now at the Crystal Palace) is already well in hand. The Science Collections have been transferred to three unfinished galleries in the eastern block of the new Science Museum building, which were not vacated by the Post Office Savings Bank department until towards the end of September. The total floor-area available in these galleries is only about two-thirds that in the Western Galleries, which were already much overcrowded; but by using two of the new galleries as store-rooms, in which objects are packed very closely together, it has been possible to arrange objects in the third gallery under conditions which allowed this gallery to be opened to the public in November. Here are shown groups of objects selected from the sections illustrating astronomy, surveying, meteorology, chemistry, optics, sound, and botany. The remaining objects in these sections, and all the objects in the sections illustrating mathematics, general physics, photography, kinematography, heat, geophysics, geology, geography, and oceanography—forming altogether about eighty per cent. of the Science Collections—are thus stored away, and cannot be placed on exhibition again until further space becomes available.

On Tuesday, December 18, a letter appeared in *The Times* from the Chairman of the Advisory Council of the Science Museum (Sir Hugh Bell), stating that a resolution had been forwarded to the President of the Board of Education, protesting against the inadequate space available for the display of the collections and urging upon H.M. Government the importance of completing the whole of the Eastern Block of the new Science Museum buildings forthwith, thus raising the space available for exhibition to 180,000 square feet, and since this would not provide all the space which was considered immediately necessary in 1912, of preparing plans for a central block as soon as possible. The societies who have adopted the resolution include the following: The Royal Society; The British Association for the Advancement of Science; The British Science Guild; The Chemical Society; The Faraday Society; The Institute of Chemistry of Great Britain and Ireland, and the Society of Chemical Industry.

Chemical Constitution and Pharmacological Action

AT the last meeting of the Aberdeen Chemical Club (Professor Findlay presiding), Professor C. R. Marshall gave a lecture on "The Relationship between Chemical Constitution and Pharmacological Action." The lecture dealt mainly with the Professor's own investigations. Among inorganic substances, he said, the relationship was found to be expressed best by the theory of dissociation. This was exemplified by the germicidal action of some metallic salts. Thus the germicidal action of silver nitrate solutions was stated to be diminished 10,000 times by the addition of a molecular quantity of potassium cyanide, and mercuric chloride, which dissociates in solution more readily than mercuric cyanide, was said to be more powerfully germicidal. But it was in organic chemistry that this relationship found its chief interest. How the introduction of various groupings modified the pharmacological action of chemical substances, and how, in consequence, new drugs with more or less definite actions could be prepared, was explained. Most of the new organic drugs which had been introduced during the past 50 years had been obtained as a result of researches of this kind. Some of them were among the most important in medicine. Anomalous actions were common; sometimes very closely allied substances chemically produced markedly different pharmacological actions. The subject was of interest, not only from the view of producing new drugs, but also of aiding us to unravel the chemical changes which occur in the body. Discussion followed, and the meeting concluded with a vote of thanks to the lecturer, proposed by Professor Findlay.

Spraying by Ethyl Chloride

To the Editor of THE CHEMICAL AGE.

SIR,—I perused with great interest an article in your journal of October 27, 1923, on "The Utilisation of Dyestuffs as Antiseptics," by S. Ellingworth, M.Sc. Without in any way desiring to take up valuable space in your publication by going further into this important matter, I should like to draw your attention to the fact that we have for some years been supplying preparations containing Malachite Green, Crystal Violet, Brilliant Green, Iodine, Picric Acid, etc.—in fact, over 50 different preparations in solution form. The various ingredients are dissolved by ethyl chloride in self-spraying bottles—that is to say, the liquid is ejected from the container by the pressure of the ethyl chloride gas. The bottles are hermetically closed, and the contents, therefore, are never contaminated, and any quantity can be drawn from the container as desired.

The information contained in this letter will no doubt prove of value to your readers, and may encourage further research in this direction. It must be apparent that to have preparations ready at any moment is a great advantage. Ointments, aqueous and alcoholic solutions, are dispensed with, and the dyes and drugs can be applied internally as well as externally. The effect is that the ethyl chloride immediately evaporates and deposits the drug in the required position. The method of spraying by ethyl chloride is an absolutely clean and rapid one, and the preparation can be administered frequently without trouble or detriment.—I am, etc.,

ALBERT HENNING,
Chairman and Managing Director
London, Dec. 14. HEDLEY AND CO. (LEYTONSTONE), LTD.

Automatic Telephone Installation at Wembley

A REMARKABLE system of internal communication is being installed by the Relay Automatic Telephone Co., Ltd., at the British Empire Exhibition at Wembley, next year, to connect all the Dominions and Colonies with each other and with the Exhibition Headquarters. The switchboard, which will be accommodated on a stand in the Building Section, will be open to the inspection of visitors, and should, in view of the general adoption of automatic telephones, prove of considerable interest, as comparatively few people have seen an automatic exchange in operation.

The Relay Automatic Co. is at present working on the switchboard for the British Empire Exhibition. Work in installing the lines was begun on December 1, and the whole system will be ready for use on January 1. In addition to the Exchange in the Building Section, the Relay Co. is occupying a site 500 sq. ft. in the Engineering Section, where latest models in public exchange, private automatic exchange and private automatic branch exchange will be shown in operation. A private automatic branch exchange is also being exhibited in the British Government Pavilion. Among the advantages claimed for the Relay system it is said that there is no wear and tear, no oiling, no cleaning, no need for protection against dust or heat, and the system is the only one which will work at sea. The system is already in operation in many of the big buildings in London and elsewhere.

The Oil and Colour Chemists' Association

A MEETING of the Oil and Colour Chemists' Association was held on Friday, December 14, at Birkbeck College, London. Dr. J. Newton Friend (the President) announced the intention of the Council to publish the Association Journal monthly in future. The Council had also, he said, appointed a part-time paid secretary, Mr. Aitken, of the Institute of Chemistry, who would start his duties in January. In future the address of the Association would be at the Institute of Chemistry, London. The President then gave a lecture on "Corrosion," in the course of which he referred to some practical field trials now being carried out with the object of determining whether such trials, which are necessarily long and expensive, will give the same results, or approximately the same, to those which are obtained in the laboratory. Clearly if this proves to be the case, then the need for prolonged field trials can be said to disappear. The laboratory experiments are being carried out at the Municipal Technical School, Birmingham.

Burlington Industrial Laboratories, Ltd.

Creditors May Benefit by a Secret Process

A MEETING of the creditors of the Burlington Industrial Laboratories, Ltd., Charing Cross Chambers, Duke Street, Adelphi, W.C.2, late of Onslow Mills, Yiewsley, Middlesex, consulting manufacturing chemists, and dealers in all kinds of chemicals and drugs, etc., was held on Monday at the offices of Mr. C. H. Whatley, the liquidator. The statement of affairs showed liabilities £1,780 13s. 9d., all due to unsecured creditors. There was a debenture holder for £848 3s. 8d.

Mr. Whatley stated that the only tangible asset of the company was an amount of £582 owing from Protocine, Ltd. (in liquidation), which might in time realise 2s. in the £. The company was incorporated on August 24, 1921. The share capital was £1,000 in one thousand shares of £1 each, all issued. The registered office at that time was at Onslow Mills, Yiewsley, Middlesex. The first year's accounts showed a loss for the year of £2,077. In August, 1921, a Mr. J. E. Fyfield advanced by way of debentures £2,000. In September, 1921, Dr. Burlin was appointed managing director at a salary of £500 and Mr. Goddard as secretary at a salary of £300. In November, 1923, Dr. Burlin ceased to be a director and Mrs. Burlin was appointed in his place.

The liquidator also referred to a secret process by which Dr. A. L. Burlin was able to convert old "news" paper into pulp of a texture and quality which permitted it to be again utilised for the manufacture of "news" print, and he stated that this process was calculated to revolutionise the existing practice of re-pulping and milling salvaged paper. Mr. Whatley added that if this process were commercially exploited it might, of course, have a very marked result so far as the payment of creditors of the present company was concerned.

After some discussion it was decided to confirm the appointment of Mr. Whatley as liquidator.

Affairs of a Chemical Inventor

AT the public examination of Mr. William Frederick Oates, of Retford, on Thursday, December 13, at the Lincoln Bankruptcy Court, the statement of affairs showed gross liabilities £702, of which £226 was fully secured, and £126 was due to preferential creditors. The assets are estimated to produce £8,938, leaving a surplus of £8,462. Debtor said in April or May, 1921, he had about £6,000 odd capital. Chancery proceedings were instituted against him in connection with a patent in regard to dyes, and certain costs were incurred. The costs were not properly taxed, in his opinion, and a creditor's petition was made upon him. He was not insolvent —far from it.

Answering Mr. J. A. Langley, who represented Dr. Hallows, the petitioning creditor, debtor said he had introduced inventions with regard to aniline dyes and the liquefaction of coal. He had asked an American firm one million pounds for carrying out the dyes invention. He told the Board of Trade the dyes were worth a million pounds, and wanted them to take them from him as a national asset.

The examination was adjourned.

Chemistry and Food Production

MR. T. W. PARKES, M.Sc., A.I.C., in a lecture on "Chemistry and Food Production" under the auspices of the Royal Society, Dublin, traced the progress of artificial fertilisation of the soil since 1840, when the matter was first really taken up seriously, up to the present day. A soil properly treated with artificial manures for 70 years would, he said, reach a permanently high standard of fertility. He mentioned that the increase of soil productivity in Germany before the war was followed by a decrease during the war owing to the absence of phosphatic manures. As series of lantern slides illustrated the lecture, with special reference to the beneficial effects which would result from the use of artificial manures on Irish soil.

Canadian Chemical Trade with U.S.A.

THE value of chemical products imported into Canada from the United States during the year ended September 30, 1923, was $18,757,000 as against $18,858,000 for the corresponding period ending in September, 1922. The imports for the same periods were valued at $7,412,000 and $6,942,000 respectively.

From Week to Week

SIR ALFRED AND LADY MOND have left England on a visit to India, where they will be the guests of the Viceroy.

THE LIBRARY of the Chemical Society will be closed for the Christmas holidays from Monday, December 24, to Thursday, December 27, inclusive.

FOLLOWING THE EXAMPLE of Manchester, the Bradford Chamber of Commerce on Wednesday unanimously accepted the Piece Dyers' Association's amended rebate terms.

IT IS ANNOUNCED that the London address of Sutcliffe Bros., and Bryce, Ltd., of Hyde, near Manchester, is now Telluric Works, Voluntary Place, New Wanstead, London, E.11.

MR. EDWARD C. DAVIES, M.Sc., a distinguished student of Professor Robert M. Wild at Manchester University, has been appointed as Assistant Lecturer in Chemistry at the Natal Technical College, Durban, S. Africa.

A LIME product reported to be remarkably pure is being quarried at Parc-y-Murch, St. George, near Abergele, analysts declaring that its purity is over 99 per cent. Steps are being taken to extend the quarrying operations.

WE HAVE RECEIVED an appeal from the National Painters' and Decorators' Joint Council suggesting that, with a view to relieving unemployment, commercial concerns, public bodies and private householders should place their decoration contracts as early as possible.

MR. JOHN GRAY, Polton Bank, Lasswade, for the last twenty-three years secretary of Annandale and Son, Ltd., Polton paper works, has died in a nursing home in Edinburgh. Mr. Gray had been connected with Polton mills for fully fifty years, and was well known in the paper trade in Scotland.

THE NATIONAL FEDERATION of Iron and Steel Manufacturers report that the production of pig-iron in November amounted to 597,600 tons, compared with 595,700 tons in October and 493,900 tons in November, 1922. The furnaces in blast at the end of the month numbered 199, an increase of 10 during the month.

THE DATE OF THE BRITISH ASSOCIATION MEETING in Toronto next year, provisionally announced for September 3 to 10, has now been altered to August 6 to 13, and the meeting will be followed by official excursions, not preceded by them, as originally proposed. The meeting will be under the presidency of Sir David Bruce.

A COLLISION which might have had disastrous consequences occurred on Thursday, December 13, at Harlesden, London, between a motor omnibus and a lorry containing cylinders of oxygen. No one was injured, but the nozzle of one of the cylinders was knocked off and propelled fifty yards along the road by the pressure of the escaping gas.

THE BRITISH DRUG HOUSES, LTD., announce that they are making a further reduction in the price of insulin from 1s. 9d. to 1s. 3d. per dose, and the reduced price will come into effect on January 1, 1924. Insulin "A.B." brand, issued by themselves and Allen and Hanburys, Ltd., jointly, is now available in large quantities, and all demands can be met promptly.

TWO MAGISTRATES at the Birkenhead Police Court were called upon on Friday, December 14, to give a standard for commercial cream of tartar, and they decided that any which contained up to fifty parts of lead per million were safe for ordinary purposes. Mr. H. E. Davies, the Borough Analyst, and Mr. W. H. Roberts, Liverpool City Analyst, were among those who gave evidence.

THE ADMIRALTY is experimenting with a new extract, in tablet form, of watercress, spinach, and other green plants, called phyllosan, which it is suggested may supersede lime juice for the treatment of scurvy. Phyllosan is the discovery of Professor E. Buergi, M.D., of Berne University, and is made from chlorophyll, the vital fluid in plants which bears a close chemical relationship to human blood pigments.

AT THE ANNUAL DINNER of the Institution of Mechanical Engineers in London on Thursday, December 13, the president, Sir John Dewrance, announced that a new research fund, called the George Stephenson Fund, had been formed owing to the beneficence of Professor Coker. Mr. W. H. Allen had presented £1,000 to the fund for the purpose of sending one student selected by the Institute to Cambridge for three years.

IN A REPORT submitted to the Court Governors of Middlesex Hospital on Friday, December 14, it was stated that under the auspices of the Council of the Medical School, important research work in connection with the manufacture of insulin had been started in the Bio-chemical Department, with results that even now might be judged successful, and with hopes of effecting improvements and insuring the greater purity of the drug.

THE FRENCH CHAMBER OF DEPUTIES on Wednesday, on the occasion of the twenty-fifth anniversary of the discovery of radium, granted an annual pension of 40,000 francs (nearly £500) to Madame Curie, upon whose death the pension will revert in equal shares to her two children. The Minister of Public Instruction paid a tribute to the importance of the discovery of radium by the late Professor Curie, with the assistance of his wife.

AT A MEETING of the East Suffolk Development Syndicate, Ltd., at Halesworth, on Tuesday, the chairman said the syndicate was erecting a sugar beet factory at Southwold Harbour in time for next season, and had also acquired the harbour, while a circular railway of about 45 miles in length and embracing about 200,000 acres was in contemplation for the transport of beet. The new factory is expected to produce 8,000 tons of sugar a year.

ALTHOUGH NOT SO GREAT as the previous week, the coal output from the mines of Great Britain during the week ended December 1, showed a large increase over the average returns for the past few months. The quantity mined was 5,719,200 tons, as compared with 5,726,300 tons in the previous week, and 5,573,300 tons in the corresponding period of the previous year. The number of wage earners employed at the mines was 1,181,400, as compared with 1,179,800 in the previous week.

THE INSTONE CO., at an extraordinary general meeting on Monday in London, increased its capital by half a million for the purpose of acquiring the Hoyland Silkstone Colliery, South Yorkshire, and erecting plant for utilising the by-products. Sir Samuel Instone, presiding, said that profits to be made by those processes were enormous. He added that the wasteful use of coal as consumed at the present time represented enough money to wipe out the National Debt in a few years. All that value now went up the chimney.

THE DEATH took place at Gateshead on Wednesday of Mr. Thomas Wilkinson, sen. Mr. Wilkinson, who was in his eighty-fourth year, went to Gateshead from Houghton-le-Spring in 1859, having served his apprenticeship at Hopper's engineering works. After some years at Hawk's and Abbots' works, he went to Allhusen's chemical works, where he supervised the erection of large plant. In 1882 he was appointed engineer to Friars Goose Chemical Works, where he remained until his retirement some nine years ago. During his service with the United Alkali Company he laid out and erected new chemical works in London.

SIR WILLIAM ALEXANDER, M.P., has addressed a letter to the Lord Provost of Glasgow stating that having learned of the existence of the Lord Provost's Fund for the relief of genuine distress in necessitous cases he has pleasure in sending a cheque for £200 towards the fund. The Lord Provost has conveyed to Sir William Alexander his grateful thanks for his generous contribution, and trusts that his example will be followed by other citizens as his Fund is rapidly becoming exhausted, and additional contributions are urgently required in order to deal with the many deserving cases of genuine distress which come under his notice.

DR. FENTON, Medical Officer for Kensington, lecturing at the Institute of Hygiene in London on Tuesday, condemned the addition of chemical preservatives and artificial colouring matter to foodstuffs. The practice, he said, had grown to such an extent as to be dangerous to health. The fact that chemical preservatives could be taken into the human system for a short time without having any apparent effect on the health did not prove that the chemical did not impair health and shorten life if taken over long periods. The danger was serious because so many foodstuffs were now impregnated with chemical preservatives. The moral which Dr. Fenton drew was that the Government should lay down legal standards of purity for all foodstuffs, and make manufacturers and producers responsible for any breach of the regulations. Meantime the public should protect themselves by demanding pure food free from chemical preservatives and artificial colouring matter.

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Patent Literature

Abstracts of Complete Specifications

206,475. Purifying or Separating Apparatus for Liquids. K. J. Svensson and K. A. P. Norling, 16, Woburn Square, London, W.C.2. International Convention date, November 3, 1922.

In the separation or purification of liquids of different specific gravities or of liquids and solids which are contained in a large tank, it is usually necessary to pass the contents through a separator or purifying apparatus several times in succession, owing to the mixing of the purified liquid with the unseparated liquid when returned to the tank. In this invention, assuming that the purified liquid has a lower specific gravity than the unpurified liquid, it is returned to the tank through a pipe which has an enlarged outlet situated just below the surface of the liquid and directed upwards. The purified liquid thus does not mix with the unpurified liquid, but spreads along the surface and floats upon it. In a modification, the main tank is closed at the top, and a small tank is arranged just above and communicates with it by a diverging conduit. The purified liquid is returned to the small tank and gradually passes downwards into the large tank. If the purified liquid is heavier than the unpurified liquid, the return pipe terminates at the bottom of the main tank. In all cases the liquid is withdrawn for purification at a point remote from its return.

206,770. Rendering Cellulose Derivatives Non-Inflammable, Method of. G. Leysieffer, Troisdorf, Rhineland, Germany. Application date, February 22, 1923.

Plastic cellulose ethers, esters or other cellulose derivatives are rendered non-inflammable by mixing them with calcium sulphate and a phosphoric ester such as triphenyl phosphate. Nitro cellulose thus treated cannot be ignited.

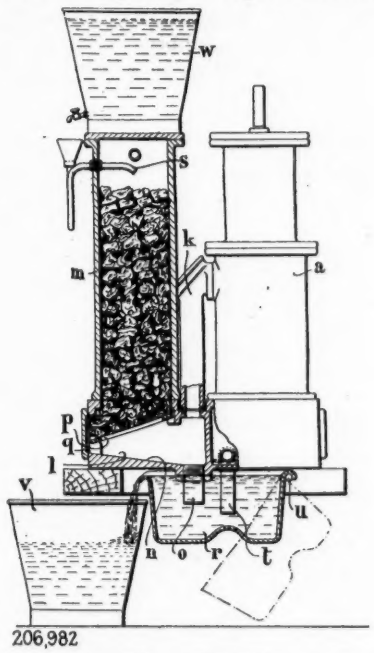
Note.—Abstracts of the following specifications which are now accepted, appeared in The Chemical Age when they became open to inspection under the International Convention:—181,393 (L. Lilienfeld) relating to manufacture of cellulose ethers, see Vol. VII, p. 249; 184,193 (Badische Anilin and Soda Fabrik) relating to a process for producing a blue vat dyestuff of the anthracene series, see Vol. VII, p. 538; 186,616 (F. Duplan) relating to a process for distilling tars, see Vol. VII, p. 798; 189,772 (C. Fraisse) relating to separating a gas or vapour from a liquid, or dissolving a gas or vapour in a liquid, see Vol. VIII, p. 152.

206,954. Silver Iodide and Protein Substances, Compounds of. E. C. R. Marks, London. From Parke, Davis and Co., 2,951, Atwater Street East, Detroit, Mich., U.S.A. Application date, August 29, 1922.

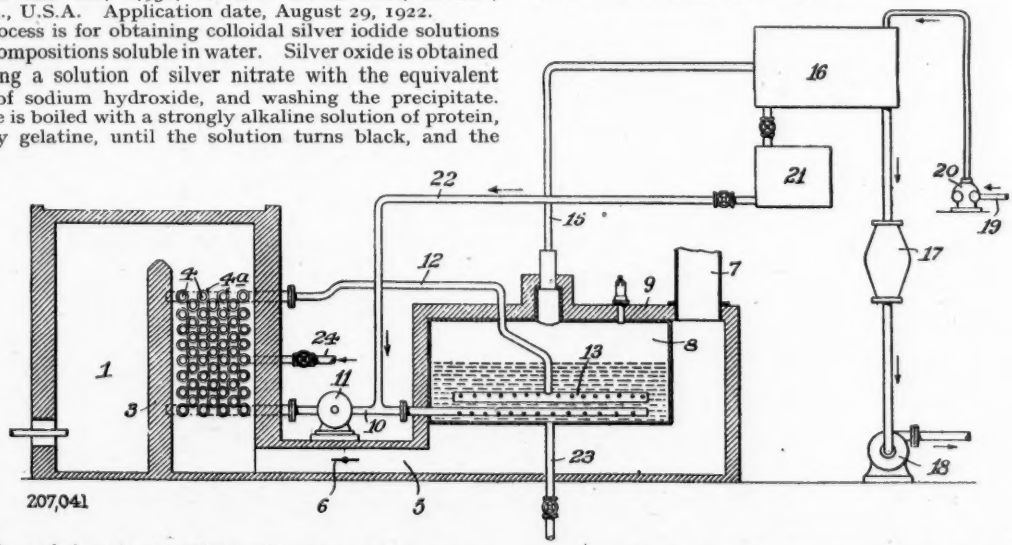
The process is for obtaining colloidal silver iodide solutions and dry compositions soluble in water. Silver oxide is obtained by treating a solution of silver nitrate with the equivalent amount of sodium hydroxide, and washing the precipitate. The oxide is boiled with a strongly alkaline solution of protein, preferably gelatine, until the solution turns black, and the solution is cooled and neutralised with acid. This solution, containing colloidal metallic silver, is treated with iodine in a mortar until the black solution becomes grey, when it contains colloidal silver iodide. The solution is neutralised with acetic acid and then filtered and evaporated to dryness. The product has strong germicidal properties and dissolves in water, forming a clear solution of silver iodide.

206,982. Scrubbers for use in Gas Producer Plants. Ruston and Hornsby, Ltd., F. H. Livens, and E. J. Grieve, Sheaf Iron Works, Waterside South, Lincoln. Application date, October 4, 1922.

The object is to facilitate the cleaning of gas scrubbers. Gas passes from the producer *a* through a conduit *k* to a chamber *l*, and thence upwards through the scrubber *m* which contains coke or other filler. The filler rests on an inclined grid *p* at the lower end of which an opening *q* is provided, through which the filling material may be removed by gravity when necessary. Water is supplied to the top of the scrubber from a tank *w*, and is discharged over an inclined floor *n* to a receiver *r* and thence to a tank *v*.



206,982



207,041

207,041. Distilling Oil, Apparatus for. T. E. Robertson, London, From Power Specialty Co., 111, Broadway, New York. Application date, November 23, 1922.

This apparatus is of the type in which oil is injected into a

circulating system comprising a tubular heater in a furnace, and a vapour releaser heated by the furnace gases. The oil heating tubes 4 are arranged in the furnace 1, but are protected from direct radiation by a bridge 3. The tubes 4 are of wrought iron or steel, and have corrugated casings of cast iron to facilitate heating. The furnace gases pass through a conduit 5 and are then used for heating an oil tank 8. The pipe 10 supplying the tubes 4 is provided with intake openings disposed over the bottom of the tank 8, and the heated oil passes through a pipe 12 to a perforated distributing pipe 13 in the tank 8. The vapour evolved from the oil passes through a pipe 15 to a heat interchanger 16, and thence to a condenser 17, from which the liquefied products are removed by a pump 18. Fresh oil is supplied by a pump 20 to the heat interchanger 16, where it is preheated, and then passes to a tank 21. The preheated oil may be supplied through a pipe 22 either to the suction side of the pump 11 or to the tank 8. Steam may be supplied through a pipe 24 to the heater 4 where it is superheated and mixes with the oil. The steam protects the pipes 4 and the oil from overheating, and its latent heat is recovered in the interchanger 16.

207,000. DYESTUFFS. J. Thomas and Scottish Dyes, Ltd., Murrell Hill Works, Carlisle. Application date, October 20, 1922.

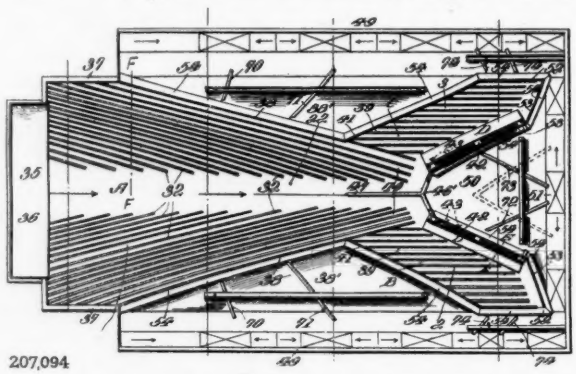
In the manufacture of flavanthrone by treating 2-amino-anthraquinone with antimony pentachloride in boiling nitro-benzene, a considerable quantity of by-products is usually obtained, which can be utilised in this invention. The flavanthrone is filtered off, and nitro-benzene removed from the mother liquor by direct distillation in vacuo, or by steam distillation, leaving a black residue. This is very finely powdered, suspended in sulphuric acid of 10 per cent. strength and sodium bichromate, and heated to 100° C. for several hours. A yellowish-brown paste is obtained which dyes cotton brown shades from an alkaline hydrosulphite vat.

207,073. OBTAINING OILS FROM SHALES AND NON-CAKING COALS, PROCESS FOR. H. Edwards, Latton Lodge, Conisboro Avenue, Caversham, Berks, and G. Young, 46, Church Crescent, Church End, Finchley, London, N.3. Application date, January 9, 1923.

Specification 153,663 (see THE CHEMICAL AGE, Vol. III, p. 689) describes the distillation of shales or coals, and the object of the present invention is to obtain an increased yield of condensible oils and ammonia. The shale or coal is finely ground, and may be concentrated or cleaned to remove material such as pyrites or silicates. The finely divided material is passed through a closed or muffled furnace provided with mechanical means for continuously stirring or turning over the charge. The temperature of the furnace is controlled in such a manner that different sections are kept at different specific temperatures, in which different gases or vapours are obtained according to the temperatures. The material passes over the furnace floor in a thin layer, and its rate of passage is so regulated that distillation is completed in each zone before the material passes into the next zone. The complete distillation of the material thus takes place at the lowest possible temperatures. The temperature of the last zone is that at which it is desired to stop distillation. Superheated steam may be introduced into any desired zone, and the oils and gases are drawn off separately from each zone and condensed. The oils are thus obtained directly from the solid material by fractional distillation.

207,094. SEPARATION OF DRY MATERIALS, PROCESS AND APPARATUS FOR. H. M. Sutton, W. L. Steele, and E. G. Steele, Forney Avenue, and Fletcher Street, Dallas, Tex., U.S.A. Application date, February 20, 1923.

The apparatus is suitable for separating ores such as iron ore, zinc and lead ores, etc. The material is stratified by means of a vibratory movement applied to a supporting table, while air is forced upwards under pressure through it. The table is approximately Y-shaped in plan view, and it is subjected to a differential reciprocation or jigging movement by means of rotating eccentrics arranged below the table. The table is lifted in a diagonal line on its forward stroke, and falls back on its return stroke. The table 1 comprises a concentrating and separating deck 22, having an air chamber below it, to which air supply pipes are flexibly connected so as to be independent of the reciprocating movement of the table. The floor of the table is constructed of a number of ribs supporting a coarse wire netting, which supports the pervious floor. A second layer of coarse wire netting is arranged on the floor, and above this are riffles 32 which extend inwards at an angle towards the arms of the Y, leaving an unobstructed central portion A. The material to be separated is supplied from a feed pan 36, and forms a progressively narrowing stream by reason of the converging tailing riffles 38, over which the lighter particles pass while the remainder of the stream passes on to the banking members 42, which retain the heavier particles. The lighter material is thus held back by the banking zone of heavier particles, and the lighter material overflows the tailing riffle 41. All the riffles 32 gradually increase in height from the forward to the rear end. The two divergent separating channels B, C are each provided with parallel riffles 39, which are shorter than the width of the channels, so that divergent pathways D are left for the heavier elements of the materials. At the inner edges of the channels 39, concentrating members 42 are arranged, comprising a number of sections 43 which are laterally movable, so that the concentrating member may be continuous or broken, to release certain products from the concentration. The inner ends of the concentrating number 42 are joined by an angle wall 46, having a longitudinal extension 47. Opposite sides of the table are provided with outwardly and downwardly directed planes 38, which deliver into receiving shoots 49. The feed end of the floor 1 is lowest in the centre, and inclines outwards and upwards at an angle which decreases gradually towards the line B, where the table is level. The table gradually inclines in a forward direction to the line C, beyond which it inclines downwards and outwards towards the sides. Air is forced upwards through the table, thus causing a stratification of the material so that the heavier particles converge towards the centre of the table. The lighter particles float to the top, and are discharged over the tailing riffles 38, between the guides 70, 71. A heavier grade of material passes over the riffles 38 beyond the guides 71, and is separately collected. The material then passes into the diverging channels 2, 3, where the riffles 39 cause the heavier particles to be concentrated against the concentrating member 42, while the lighter constituents overflow the tailing riffle 41. If the heavier portion comprises several different constituents, these may be separated by forming the member 42 as a number of pivoted sections which may be opened to discharge any desired constituent. The general inclination of the table is upwards from the feed to the discharge end, and the unobstructed portions A, B are provided to allow a free passage of the heavier material.



207,094

NOTE.—Abstracts of the following specifications which are now accepted appeared in THE CHEMICAL AGE when they became open to inspection under the International Convention :—197,632 (Naugatuck Chemical Co.), relating to vulcanising indiarubber, using condensation products of ammonia and aldehydes as accelerators, see Vol. IX, p. 69; 198,379 (Chemische Fabrik Auf Actien vorm. E. Schering), relating to the manufacture of barbituric acid compounds, see Vol. IX, p. 130; 203,683 (Soc. d'Etudes Chimiques pour l'Industrie), relating to the manufacture of manures containing soluble organic nitrogen from cyanamide, see Vol. IX, p. 522.

International Specifications not yet Accepted

205,502–3. DYES. Farbwerke vorm. Meister, Lucius, and Brüning, Hoechst-on-Main, Germany. International Convention date, October 12, 1922.

205,502. Benzanthrone, or a substitution product having a free 1^1-position, is condensed with an aromatic acid chloride in the presence of a catalytic or condensing agent such as aluminium chloride, with or without zinc chloride. Vat dyestuffs are obtained which dye cotton yellow to deep orange shades from red to bluish-red hydrosulphite vats. In an example, benzanthrone may be condensed with benzoyl chloride, yielding 3 : 4 : 8 : 9-dibenzopyrene-5 : 10-quinone. Other components which may be used are α-oxybenzanthrone and benzanthrone quinoline; and toluic acid chloride, chlorbenzoyl chloride, nitrobenzoyl chloride, and *p*-toluic chloride.

205,503. Diazotised *m*-amino-benzaldehyde or a substitution product, or a substance such as an oxime, hydrazone, or aldazine which yields *m*-amino-benzaldehyde, is coupled with a pyrazolone, yielding monoazo dyes which dye wool greenish yellow shades from an acid bath. Examples are given in which the following components are coupled :—(1) Diazotised *m*-amino-benzaldehyde and 1-*p*-sulphophenyl-5-pyrazolone-3-carboxylic acid or 1-(4^1-sulpho-2^1-tolyl)-5-pyrazolone-3-carboxylic acid, (2) diazotised 2-chlor-5-amino-benzaldehyde and 1-*p*-sulphophenyl-5-pyrazolone-3-carboxylic acid or 1-phenyl-3-methyl-5-pyrazolone. The latter dyestuff may be sulphonated to yield the same product as that obtained by coupling 2-chlor-5-amino-benzaldehyde and 1-*p*-sulphophenyl-3-methyl-5-pyrazolone. Halogen or oxy-derivatives such as the 1-(2^1-chlor-5^1-sulphophenyl) or 1-(5^1-sulpho-3^1-carboxy-2^1-oxy-phenyl)-3-methyl-5-pyrazolone may also be used.

205,790. DYES. Farbenfabriken vorm. F. Bayer and Co., Leverkusen, near Cologne, Germany. International Convention date, October 19, 1922.

Vat dyestuffs made by condensing α-derivatives of naphthisatins with α-naphthol or α-anthrol, or derivatives having a free ortho position to the hydroxyl group, are halogenated by sulphuryl chloride in the naphthol or anthrol nucleus. In an example, the dyestuff from β-naphthisatin-α-chloride and α-anthrol is treated with sulphuryl chloride in chlorobenzene, yielding a product which dyes bluish-black shades from a hydrosulphite vat.

205,827. DISINFECTANTS AND ANTISEPTICS. Koholyt Akt.-Ges., 75, Potsdamerstrasse, Berlin. International Convention date, October 21, 1922.

Plant extracts such as sulphite lye or tanning extracts are halogenated—*e.g.*, with chlorine until the reddish-yellow precipitate has a chlorine content of at least 10 per cent. The product may then be treated with an oxidising agent such as chloric acid, and yields a substance which may be mixed with ointments or soaps, for antiseptic purposes, as a fungicide, or for preserving wood or animal or vegetable fibres. The product should be used in acid solution, preferably in the presence of neutral salts.

205,833. EXTRACTING OILS AND FATS. Australian Lanoline Proprietary Ltd., 360, Collins Street, Melbourne. Assignees of J. Avery, 4, Kelvin Grove, Armadale, Victoria, Australia. International Convention date, October 23, 1922.

The separation of oils, fats and waxes—*e.g.*, wool fat—from emulsions by froth flotation depends on the temperature of the liquid and the froth, the quantity of air used, the fineness of the bubbles, the depth of the liquid and froth, and the draining and washing of the froth. Liquor containing wool fat is cooled to 90°–100° F. and passed through a series of boxes having a depth of 1 ft. provided with a canvas base, through which air is forced. the froth is sprayed into cold water to make it spongy, and removed continuously or in batches. The froth removed is washed with water and dried by heat. The process is applicable for treating other emulsions of oils and water.

LATEST NOTIFICATIONS.

208,114. Processes for making nitrate of potassium. Michael and Co., J. December 7, 1922.

208,117. Apparatus for the distillation of coal or the like. Rühr, A. December 7, 1922.

208,140. Treatment of liquids. Rafn, R. December 8, 1922.

208,143. Production of albumen products or compounds containing arsenic. Haco Ges. Akt.-Ges. Bern. December 9, 1922.

208,151. Production of organic mercury compounds. Albert, Dr. A. December 5, 1922.

208,155. Process for chlorinating benzene. Farbwerke vorm. Meister, Lucius, and Brüning. December 5, 1922.

208,162. Manufacture of disazo dyestuffs. Durand and Huguenin Akt.-Ges. December 11, 1922.

Specifications Accepted, with Date of Application

192,032. Sodium Nitrate, Manufacture of. Guggenheim Bros. January 19, 1922.

195,033. Emulsions, and the method of preparing the same. P. M. Travis and C. A. Glabau. March 17, 1922.

195,598. Illuminating or coal gas or coke-oven gases intended for the recovery of hydrogen by partial liquefaction, Preliminary treatment or purification of. L'Air Liquide Soc. Anon. pour l'Etude et l'Exploitation des Procédés G. Claude. March 30, 1922.

200,087. Acetylene, Process for the production of solid polymerisation products of. Elektrizitätswerk Lonza. June 30, 1922.

207,566. Gases, Apparatus for Cleaning or Cooling—or otherwise Treating with Liquids. M. Aurig and G. Brucklmayr. May 30, 1922.

207,570. Vulcanised Rubber and Similar Materials, Manufacture of. W. J. Mellersh-Jackson. (*Morgan and Wright*). June 29, 1922.

207,589. Acid Plant Equipment. A. M. Fairlie. August 25, 1922.

207,598. Materials Containing Cellulose, Process for Treating. W. P. Perry. August 28, 1922.

207,623. Carbonaceous and like materials, Distillation of heat-treatment of. H. Nielsen and B. Laing. September 1, 1922.

207,630. Electrolytic Gas Generating Systems. J. P. Scott. September 4, 1922.

207,651. Gasifying Bituminous Fuel, Process and Apparatus for. A. Breisig. September 19, 1922.

207,660. Oils, Purification of. R. D. Masson and H. Engel. October 7, 1922.

207,678. Soluble Sulphonated Oils of Animal Origin, Manufacture and Production of. M. I. Aische. October 25, 1922.

207,679. Aluminium, Process for the Recovery of. D. R. Tullis. October 27, 1922.

207,696. Waters Containing Alkaline Bicarbonates, Treatment of. E. D. Grant and Becco Engineering and Chemical Co., Ltd. November 22, 1922.

207,711. Dyeing Acetyl Silk in Deep Fast Shades by Direct Dyeing. British Dyestuffs Corporation, Ltd., J. Baddiley and W. W. Tatum. December 21, 1922.

Applications for Patents

Akt.-Ges. für Anilin-Fabrikation, and Bloxam, A. G. Process for hardening colloids. 31033. December 10.

American Rubber Co. Treating rubber latex, etc. 31042. December 10. (United States, August 18.)

Ammonia Casale Soc. Anon. Catalysts for synthesis of ammonia. 31168. December 11. (Italy, June 29.)

Bloxam, A. G., and Chemische Frabrik Griesheim-Elektron. Manufacture of azo-dyestuffs. 31359. December 13.

Chaney, W. Manufacture of coal gas and water gas. 31454. December 14.

Comyn, B. D. Apparatus for separating liquids of different specific gravities. 31406. December 14.

Deguide, C. Manufacture of barium cyanide. 30988. December 10.

Donald, W. Drying peat. 30940. December 10.

Donald, W. Drying peat, &c. 31426. December 14.

Gasoline Products Co., Inc., and Golby, F. W. Method for treating hydrocarbons. 30981. December 10.

Heitmann, M. J. Lubricating-oil emulsions. 31375. December 13. (Germany, December 28, 1922.)

Jackson, W. J. Mellersh-, and Hurt Engineering Corporation. Manufacture of sulphuric acid. 31118. December 11.

Morton Sundour Fabrics, Ltd., Thomas, J., and Wylam, B. Production of dyestuffs, etc. 31264. December 12.

Naamlooze Vennootschap Algemeene Norit Maatschappij. Manufacture of decolorising carbon. 31451. December 14. (Holland, November 19, 1921.)

Scottish Dyes, Ltd., Temperley, A. G., and Thomas J. Dyeing. 31265. December 12.

Soc. des Etablissements Barbet. Continuous rectification of hydrocarbons, etc. 31145. December 11. (France, December 11, 1922.)

Soc. Française des Crins Artificiels. Conservation of the pellicles of hydrate or of hydrated ethers of cellulose. 31444. December 14. (France, November 8.)

Union Oil Co. of California. Decolorising petroleum distillates. 31017. December 10. (United States, April 4).

Vains, A. R. de. Chlorination of raw cellulose. 31362. December 13. (France, December 18, 1922).

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to* THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.

London, December 20, 1923.

HAVING regard to the near approach of the Christmas holidays and the stock-taking period, business has shown surprising activity, and quite a satisfactory volume of trade is reported during the past week.

Prices generally tend upwards, in many lines a shortage of supplies is becoming evident. There has been a much better export inquiry, and quite a few orders have been put through.

General Chemicals

ACETONE has been in good demand, supplies are short and the price is very firm.

ACID ACETIC has been well inquired for and a good volume of business has been transacted. Price is higher.

ACID CITRIC is uninteresting. Price is very low and any substantial demand would be immediately reflected in the price.

ACID FORMIC supplies are scare, as the German makes have been cut off. Supplies near to hand command a fair premium.

ACID LACTIC.—Unchanged.

ACID OXALIC is quietly steady and the forward tendency is upward.

ACID TARTARIC is in better demand—makers are looking for higher prices.

FORMALDEHYDE is firm and moderately active.

LEAD ACETATE is a bright spot, tendency in sellers' favour.

LIME ACETATE is very scare for early delivery. Small stocks available are well sold.

LITHOPONE is unchanged.

POTASH CAUSTIC AND CARBONATE are unchanged.

METHYL ALCOHOL is again firmer in price.

POTASH PERMANGANATE is unchanged.

POTASH PRUSSIATE is rather slow of sale. Price is well held.

SODIUM ACETATE is in slow demand with makers well sold; little change is to be expected.

SODIUM CAUSTIC.—English makers have reduced their price for next year.

SODIUM NITRITE is in very short supply, and the demand is good.

SODIUM PRUSSIATE is fairly active and seems likely to improve in value.

Pharmaceutical Chemicals

ACETYL SALICYLIC ACID continues in good demand; price unchanged.

ACID LACTIC.—Advanced prices are readily paid for the limited supplies which are available.

ACID SALICYLIC remains remarkably firm, in spite of the somewhat easier position of carbolic acid.

BROMIDES.—The recent advance has resulted in some holders accepting slightly less than the highest price asked, but the outlook is generally firm.

COCAINE has advanced.

GUAIACOL continues in short supply.

HEXAMINE is firm and likely to advance further in sympathy with the raw material.

PHENAZONE is temporarily easier, due apparently to the arrival of a small shipment secured on exceptional terms.

PHENOLPHTHALEIN is in better supply.

SODA SALICYLATE.—Stocks of the leading brands are low and prices are well maintained.

SALOL is in short supply and higher prices are asked in most directions.

SODA BENZOATE.—The market is almost bare of strictly B.P. quality.

VANILIN is unchanged.

Coal Tar Intermediates

There is little change to report in the situation of this market. Supplies continue satisfactory and fair inquiries have been received.

ALPHA NAPHTHOL is unchanged in price.

ALPHA NAPHTHYLAMINE is steady.

ANILINE OIL AND SALT continue in good demand, with a steady inquiry on export account.

BETA NAPHTHOL is featureless.

DIMETHYLANILINE has been in demand on export account.

"G" SALT.—A fair home business has been placed.

"H" ACID continues to pass regularly into consumption at last quoted price.

METAPHENYLENEDIAMINE.—Some inquiry is reported.

MONOCHLORBENZOL is in demand on export account.

Coal Tar Products

The market generally in coal tar products is quiet, with little fresh inquiry.

90% BENZOL is plentiful, and is worth 1s. 1½d. to 1s. 2d. per gallon on rails in tank wagons.

PURE BENZOL is also in poor demand, and is worth 1s. 5d. to 1s. 7d. per gallon on rails.

CREOSOTE OIL is steady, and remains unchanged from last week.

CRESYLIC ACID has also no great inquiry, and is quoted at 1s. 10d. to 2s. per gallon for the Pale quality 97/99%, while the Dark quality 95/97% is quoted at 1s. 6d. to 1s. 8d. per gallon.

SOLVENT NAPHTHA is also plentiful, and is quoted at 11d. to 1s. per gallon on rails.

HEAVY NAPHTHA shows no change at 1s. per gallon on rails.

NAPHTHALENES are steady at £7 to £7 10s. per ton for the low grade qualities; £8 to £8 10s. per ton for 74/76; and £8 15s. to £9 5s. per ton for 76/78.

PITCH.—The market remains weak, and prices continue to drop. To-day's values are: London, 100s. to 105s.; East and West Coast, 95s. to 100s.

Sulphate of Ammonia

The demand is satisfactory, and prices are unchanged.

Science in Industry

Speeches at the Salters' Company Dinner

THE Distribution Day dinner of the Salters' Company was held in London on Thursday, December 13. The Master (Dr. A. C. Hill), who presided, was supported by his wardens, Mr. C. A. Hill and Mr. R. de Q. Quincey; the renter, Lieutenant-Colonel R. S. Weston; and the clerk, Mr. G. E. Nichols.

Lord Askwith, in proposing the toast of "Science and Industry," said that the claims of science upon industry to apply inventions were increasing daily. Whether we advanced in the front rank depended upon the brains, the energy, and the enterprise of our people. We were living in difficult times, and industry was continually crying out for the help of science, but science could do little unless industry also came to its aid. The Salters' Company was one of those bodies which had been endeavouring to get in closer touch with industry combined with science, and the Salters' Institute was one from which they hoped great things.

Sir Max Muspratt, one of the heads of the alkali industry, responding, said that the combination of the practical and the scientific side of industry was not superior in any country to what it was in Great Britain, and recently new issues and problems of vital importance had appeared. Psychology was one of the sciences which had to be studied and made practical, and in connection with medical science and economics much could be done.

The health of the visitors, proposed by the Master, was responded to by Sir Edward Marshall Hall, K.C.; and that of the Company, proposed by Sir Lynden Macassey, was replied to by the Master.

The guests included Sir Napier Shaw, F.R.S., Professor Sir W. Jackson Pope, Professor F. G. Hopkins, Professor Arthur Smithells, F.R.S., Director of Salters' Institute, Brigadier-General H. O. Knox, Master of the Skinners' Company, Dr. W. N. Hibbert, Master of the Founders' Company, and Professor E. H. Starling.

Current Market Prices

General Chemicals

	Per	£	s.	d.		£	s.	d.
Acetic anhydride, 90–95%	lb.	0	1	4	to	0	1	5
Acetone oil	ton	80	0	0	to	85	0	0
Acetone, pure	ton	125	0	0	to	126	0	0
Acid, Acetic, glacial, 99–100%	ton	73	0	0	to	74	0	0
Acetic, 80% pure	ton	50	0	0	to	51	0	0
Acetic, 40% pure	ton	26	0	0	to	27	0	0
Arsenic, liquid, 2000 s.g.	ton	85	0	0	to	88	0	0
Boric, commercial	ton	48	0	0	to	52	0	0
Carbolic, cryst. 39–40%	lb.	0	0	11½	to	0	1	0
Citric	lb.	0	1	5	to	0	1	5½
Formic, 85%	ton	64	0	0	to	65	0	0
Hydrofluoric	lb.	0	0	7½	to	0	0	8½
Lactic, 50 vol	ton	39	0	0	to	40	0	0
Lactic, 60 vol	ton	45	0	0	to	47	0	0
Nitric, 80 Tw	ton	24	0	0	to	25	0	0
Oxalic	lb.	0	0	5½	to	0	0	6
Phosphoric, 1.5	ton	35	0	0	to	38	0	0
Pyrogallic, cryst	lb.	0	5	9	to	0	6	0
Salicylic, technical	lb.	0	1	9½	to	0	2	0
Sulphuric, 92–93%	ton	6	0	0	to	7	0	0
Tannic, commercial	lb.	0	2	3	to	0	2	9
Tartaric	lb.	0	1	0½	to	0	1	1
Alum, lump	ton	12	10	0	to	13	0	0
Chrome	ton	23	0	0	to	24	0	0
Alumino ferric	ton	7	0	0	to	7	5	0
Aluminium, sulphate, 14–15%	ton	8	10	0	to	9	0	0
Sulphate, 17–18%	ton	10	10	0	to	11	0	0
Ammonia, anhydrous	lb.	0	1	6	to	0	1	8
.880	ton	32	0	0	to	34	0	0
.920	ton	22	0	0	to	24	0	0
Carbonate	ton	30	0	0	to	32	0	0
Chloride	ton	50	0	0	to	55	0	0
Muriate (galvanisers)	ton	32	0	0	to	33	0	0
Nitrate (pure)	ton	40	0	0	to	45	0	0
Phosphate	ton	63	0	0	to	65	0	0
Sulphocyanide, commercial 90%	lb.	0	1	1	to	0	1	3
Amyl acetate, technical	ton	280	0	0	to	300	0	0
Arsenic, white powdered	ton	65	0	0	to	68	0	0
Barium, carbonate, Witherite	ton	5	0	0	to	6	0	0
Carbonate, Precip	ton	15	0	0	to	16	0	0
Chlorate	ton	65	0	0	to	70	0	0
Chloride	ton	14	10	0	to	15	0	0
Nitrate	ton	33	0	0	to	35	0	0
Sulphate, blanc fixe, dry	ton	20	10	0	to	21	0	0
Sulphate, blanc fixe, pulp	ton	10	5	0	to	10	10	0
Sulphocyanide, 95%	lb.	0	0	11	to	0	1	0
Bleaching powder, 35–37%	ton	10	5	0	to	11	0	0
Borax crystals, commercial	ton	25	0	0	to		—	
Calcium acetate, Brown	ton	13	0	0	to	14	0	0
Grey	ton	22	0	0	to	23	0	0
Carbide	ton	13	0	0	to	13	10	0
Chloride	ton	5	15	0	to	6	0	0
Carbon bisulphide	ton	35	0	0	to	40	0	0
Casein technical	ton	80	0	0	to	90	0	0
Cerium oxalate	lb.	0	3	0	to	0	3	6
Chromium acetate	lb.	0	1	1	to	0	1	3
Cobalt acetate	lb.	0	6	0	to	0	6	6
Oxide, black	lb.	0	9	6	to	0	10	0
Copper chloride	lb.	0	1	1	to	0	1	2
Sulphate	ton	25	0	0	to	25	10	0
Cream Tartar, 98–100%	ton	86	0	0	to	88	0	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde, 40% vol	ton	63	0	0	to	64	0	0
Formusol (Rongalite)	lb.	0	1	11	to	0	2	0
Glauber salts, commercial	ton	4	0	0	to	4	10	0
Glycerin crude	ton	65	0	0	to	67	10	0
Hydrogen peroxide, 12 vols	gal	0	2	0	to	0	2	1
Iron perchloride	ton	18	0	0	to	20	0	0
Sulphate (Copperas)	ton	3	10	0	to	4	0	0
Lead acetate, white	ton	44	0	0	to	46	0	0
Carbonate (White Lead)	ton	50	0	0	to	52	0	0
Nitrate	ton	44	10	0	to	45	0	0
Litharge	ton	37	0	0	to	39	0	0
Lithophone, 30%	ton	22	10	0	to	23	0	0
Magnesium chloride	ton	3	10	0	to	3	15	0
Carbonate, light	cwt.	2	10	0	to	2	15	0
Sulphate (Epsom salts commercial)	ton	5	15	0	to	6	0	0
Sulphate (Druggists')	ton	8	0	0	to	9	0	0
Manganese Borate, commercial	ton	65	0	0	to	75	0	0
Sulphate	ton	45	0	0	to	50	0	0
Methyl acetone	ton	82	0	0	to	85	0	0
Alcohol, 1% acetone	ton	80	0	0	to	85	0	0
Nickel sulphate, single salt	ton	37	0	0	to	38	0	0
Ammonium sulphate, double salt	ton	37	0	0	to	38	0	0
Potash, Caustic	ton	32	0	0	to	34	0	0
Potassium bichromate	lb.	0	0	5½	to	0	0	6
Carbonate, 90%	ton	30	0	0	to	31	0	0
Chloride, 80%	ton	9	0	0	to	10	0	0
Chlorate	lb.	0	0	3½	to		—	
Metabisulphite, 50–52%	ton	65	0	0	to	70	0	0
Nitrate, refined	ton	38	0	0	to	40	0	0
Permanganate	lb.	0	0	10½	to	0	0	10½
Prussiate, red	lb.	0	2	10	to	0	3	0
Prussiate, yellow	lb.	0	0	10½	to	0	0	11
Sulphate, 90%	ton	10	0	0	to	10	10	0
Salammoniac, firsts	cwt.	2	15	0	to		—	
Seconds	cwt.	2	17	6	to		—	
Sodium acetate	ton	25	0	0	to	25	10	0
Arsenate, 45%	ton	45	0	0	to	48	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	0	4½	to	0	0	4½
Bisulphite, 60–62%	ton	21	0	0	to	23	0	0
Chlorate	lb.	0	0	3	to	0	0	3½
Caustic, 70%	ton	17	10	0	to	18	0	0
Caustic, 76%	ton	18	10	0	to	19	0	0
Hydrosulphite, powder	lb.	0	1	5	to	0	1	6
Hyposulphite, commercial	ton	10	10	0	to	11	0	0
Nitrite, 96–98%	ton	30	0	0	to	31	0	0
Phosphate, crystal	ton	16	0	0	to	16	10	0
Perborate	lb.	0	0	11	to	0	1	0
Prussiate	lb.	0	0	6	to		—	
Sulphide, crystals	ton	8	10	0	to	9	0	0
Sulphide, solid, 60–62 %	ton	15	0	0	to	16	10	0
Sulphite, cryst	ton	11	10	0	to	12	0	0
Strontium carbonate	ton	50	0	0	to	55	0	0
Nitrate	ton	50	0	0	to	55	0	0
Sulphate, white	ton	6	10	0	to	7	10	0
Sulphur chloride	ton	25	0	0	to	27	10	0
Flowers	ton	11	0	0	to	11	10	0
Roll	ton	9	15	0	to	10	10	0
Tartar emetic	lb.	0	0	11½	to	0	1	0
Tin perchloride, 33%	lb.	0	1	1	to	0	1	2
Perchloride, solid	lb.	0	1	3	to	0	1	4
Protochloride (tin crystals)	lb.	0	1	4	to	0	1	5
Zinc chloride 102° Tw	ton	20	0	0	to	21	0	0
Chloride, solid, 96–98%	ton	25	0	0	to	30	0	0
Oxide, 99%	ton	42	0	0	to	45	0	0
Dust, 90%	ton	50	0	0	to	55	0	0
Sulphate	ton	15	0	0	to	16	0	0

Pharmaceutical Chemicals

Acetyl salicylic acid	lb.	0	3	9	to	0	4	0
Acetanilid	lb.	0	3	3	to	0	3	6
Acid, Gallic, pure	lb.	0	3	0	to	0	3	3
Lactic, 1.21	lb.	0	2	10	to	0	3	3
Salicylic, B.P.	lb.	0	2	6	to	0	2	8
Tannic, leviss	lb.	0	3	2	to	0	3	4
Amidol	lb.	0	7	6	to	0	8	0
Amidopyrin	lb.	0	14	0	to	0	14	6
Ammon ichthosulphonate	lb	0	1	10	to	0	2	0
Barbitone	lb.	0	17	6	to	0	18	6
Beta naphthol resublimed	lb.	0	2	6	to	0	2	9
Bromide of ammonia	lb	0	0	10½	to	0	1	0
Potash	lb.	0	0	9	to	0	0	9½
Soda	lb.	0	0	9½	to	0	0	10½
Caffeine, pure	lb.	0	12	3	to	0	12	9
Calcium glycerophosphate	lb.	0	5	9	to	0	6	0
Lactate	lb.	0	2	3	to	0	2	6
Calomel	lb.	0	3	9	to	0	4	0
Chloral hydrate	lb.	0	4	3	to	0	4	6
Cocaine alkaloid	oz.	1	0	0	to	1	1	0
Hydrochloride	oz.	0	17	0	to	0	17	6
Corrosive sublimate	lb.	0	3	3	to	0	3	6
Eucalyptus oil, B.P. (70–75% eucalyptol)	lb.	0	2	6	to	0	2	8
B.P. (75–80% eucalyptol)	lb.	0	2	7	to	0	2	9
Guaiacol carbonate	lb.	0	13	6	to	0	14	0
Liquid	lb.	0	12	6	to	0	13	0
Pure crystals	lb.	0	13	0	to	0	13	6
Hexamine	lb.	0	4	6	to	0	4	9
Hydroquinone	lb.	0	4	3	to	0	4	6
Lanoline anhydrous	lb.	0	0	7	to	0	0	6
Lecithin ex ovo	lb.	1	5	0	to	1	7	6
Lithi carbonate	lb.	0	9	6	to	0	10	0
Methyl salicylate	lb.	0	3	0	to	0	3	6
Metol	lb.	0	9	0	to	0	10	0
Milk sugar	cwt.	4	2	6	to	4	10	0
Paraldehyde	lb.	0	1	7	to	0	1	9
Phenacetin	lb.	0	7	9	to	0	8	3
Phenazone	lb.	0	8	6	to	0	9	0
Phenolphthalein	lb.	0	8	3	to	0	8	6
Potassium sulpho guaiacolate	lb.	0	7	3	to	0	7	9
Quinine sulphate, B.P.	oz.	0	2	3	to		—	

	Per	£	s.	d.		£	s.	d.
Resorcin, medicinal	lb.	0	5	9	to	0	6	0
Salicylate of soda powder	lb.	0	3	0	to	0	3	3
Crystals	lb.	0	3	0	to	0	3	3
Salol	lb.	0	4	0	to	0	4	3
Soda Benzoate	lb.	0	3	6	to	0	3	9
Sulphonal	lb.	0	17	0	to	0	18	0
Terpene hydrate	lb.	0	1	9	to	0	2	0
Theobromine, pure	lb.	0	12	0	to	0	12	3
Soda salicylate	lb.	0	8	6	to	0	9	0
Vanillin	lb.	1	3	6	to	1	4	6

Coal Tar Intermediates, &c.

Alphanaphthol, crude	lb.	0	1	9	to	0	2	0
Refined	lb.	0	2	3	to	0	2	6
Alphanaphthylamine	lb.	0	1	6½	to	0	1	7
Aniline oil, drums extra	lb.	0	0	8¾	to	0	0	9
Salts	lb.	0	0	9	to	0	0	9¼
Anthracene, 40–50%	unit	0	0	8½	to	0	0	9
Benzaldehyde (free of chlorine)	lb.	0	2	9	to	0	3	0
Benzidine, base	lb.	0	4	6	to	0	4	9
Sulphate	lb.	0	3	6	to	0	3	9
Benzoic acid	lb.	0	2	0	to	0	2	3
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol	lb.	0	1	1	to	0	1	2
Betanaphthylamine, technical	lb.	0	4	0	to	0	4	3
Croceine Acid, 100% basis	lb.	0	3	3	to	0	3	6
Dichlorbenzol	lb.	0	0	9	to	0	0	10
Diethylaniline	lb.	0	4	6	to	0	4	9
Dinitrobenzol	lb.	0	1	1	to	0	1	2
Dinitrochlorbenzol	lb.	0	0	11	to	0	1	0
Dinitronaphthalene	lb.	0	1	4	to	0	1	5
Dinitrotoluol	lb.	0	1	3	to	0	1	4
Dinitrophenol	lb.	0	1	6	to	0	1	7
Dimethylaniline	lb.	0	2	9	to	0	3	0
Diphenylamine	lb.	0	3	3	to	0	3	6
H-Acid	lb.	0	4	6	to	0	4	9
Metaphenylenediamine	lb.	0	4	0	to	0	4	3
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	5	9	to	0	6	0
Metatoluylenediamine	lb.	0	4	0	to	0	4	3
Monosulphonic Acid (2.7)	lb.	0	8	6	to	0	9	6
Naphthionic acid, crude	lb.	0	2	4	to	0	2	6
Naphthionate of Soda	lb.	0	2	4	to	0	2	6
Naphthylamine-di-sulphonic-acid	lb.	0	4	0	to	0	4	3
Nevill Winther Acid	lb.	0	7	3	to	0	7	9
Nitrobenzol	lb.	0	0	7	to	0	0	8
Nitronaphthalene	lb.	0	0	11½	to	0	1	0
Nitrotoluol	lb.	0	0	8	to	0	0	9
Orthoamidophenol base	lb.	0	12	0	to	0	12	6
Orthodichlorbenzol	lb.	0	1	0	to	0	1	1
Orthotoluidine	lb.	0	0	10	to	0	0	11
Orthonitrotoluol	lb.	0	0	3	to	0	0	4
Para-amidophenol, base	lb.	0	8	6	to	0	9	0
Hydrochlor	lb.	0	7	6	to	0	8	0
Paradichlorbenzol	lb.	0	0	9	to	0	0	10
Paranitraniline	lb.	0	2	7	to	0	2	9
Paranitrophenol	lb.	0	2	3	to	0	2	6
Paranitrotoluol	lb.	0	2	9	to	0	3	0
Paraphenylenediamine, distilled	lb.	0	12	0	to	0	12	6
Paratoluidine	lb.	0	5	6	to	0	5	9
Phthalic anhydride	lb.	0	2	6	to	0	2	9
Resorcin technical	lb.	0	4	0	to	0	4	3
Sulphanilic acid, crude	lb.	0	0	9	to	0	0	10
Tolidine, base	lb.	0	7	3	to	0	7	9
Mixture	lb.	0	2	6	to	0	2	9

Essential Oils and Synthetics

Essential Oils.		£	s.	d.
Anise	c.i.f. 1/9 spot	0	1	10
Bay		0	12	0
Bergamot		0	13	0
Cajaput		0	3	3
Camphor, white	per cwt.	4	0	0
Brown	„	3	15	0
Cassia	spot and c.i.f. positions weak, c.i.f. 8/- spot	0	10	0
Cedarwood		0	1	6
Citronella (Ceylon)	easier, c.i.f. 3/9 spot	0	4	1
(Java)	c.i.f. 4/7 spot	0	4	4
Clove		0	9	6
Eucalyptus		0	2	6
Geranium Bourbon		1	16	0
Lavender		1	6	0
Lavender Spike		0	3	3
Lemon		0	2	10
Lemongrass	per oz.	0	0	2½
Lime (distilled)		0	4	0
Orange sweet (Sicilian)		0	10	6
(West Indian)		0	8	6
Palmarosa		1	0	0
Peppermint (American)		0	16	0
Mint (dementholised Japanese)		0	12	3
Patchouli		1	5	0
Otto of Rose	per oz.	1	15	0
Rosemary		0	1	9
Sandalwood		1	5	0
Sassafras		0	7	6
Thyme	2/6 to	0	8	0

Synthetics.				
Benzyl acetate	per lb.	0	3	3
Benzoate	„	0	3	6
Citral	„	0	9	6
Coumarine	„	1	0	0
Heliotropine	„	0	8	0
Ionone	„	1	5	0
Linalyl acetate	„	1	2	6
Methyl salicylate	„	0	3	0
Musk xylol	„	0	12	6
Terpeniol	„	0	2	9

Chemical and Allied Trade in South Africa

Points from an Official Report

In a report just issued by the Department of Overseas Trade on the economic conditions in South Africa * it is stated that during the year 1922 imports of soda ash, caustic soda and potash showed considerably increased figures at lower price levels. There was, however, actually a reduction in the imports of nitrates, glycerin, sulphur, and cyanides. The dislocation of the gold mining and the partial cessation of the diamond mining were doubtless responsible for this indirectly by reducing the demand for locally manufactured explosives.

Paraffin wax showed an importation double in quantity at a much lower price; but vegetable and mineral oils, though also reduced in price, were not largely imported, in spite of the increase in the motor trade.

Considerable space in the report is devoted to detailing the increase in imports from Germany. As might be expected Germany was the chief supplier of potash manures, and shared with Belgium the supply of basic slag. Belgium is set down as having captured the supply of half the asbestos manufactures which had mainly come from England for some years previously. Belgium also had the greater part of the business in spelter, Germany coming second. Belgium also supplied half the superphosphates, the premier position having been held by Holland in 1921 and Great Britain in 1920. Germany has gained in the glassware trade at the expense of Belgium and the U.S.A. British cement manufacturers, however, were more successful and secured 40 per cent. of the trade.

The exports of asbestos were nearly doubled in comparison with 1921, £60,000 worth of silver was exported as against nil in 1921, and the exports of copper and lead were 500 and 1,400 tons respectively compared with an insignificant quantity in the previous year. The greater part of the increased asbestos export was taken by the United Kingdom, with Australia second. In spite of it having been stated recently that South African corundum was particularly liked by British manufacturers, almost the whole of the 1,827 tons exported in 1922 went to America.

It is stated that a Bill dealing with pure food, drugs and disinfectants, which, as drafted, aroused some alarm among English exporters is not to be proceeded with at present.

Research Work on Rare Metals

In order that the utmost encouragement may be given to the search for and development of deposits of rare metals in the United States, specialists of the Department of the Interior, located at a station of the Bureau of Mines in Nevada, are examining specimens of ores submitted from all over the country as possibly containing minerals of which the United States lacks essential supplies. Of many samples recently examined for the rare metals, a few gave positive results for the following elements: Molybdenum, uranium, radium, vanadium, tungsten, platinum, titanium, thorium, cerium, rare earths and zirconium.

* Report on the Economic Conditions in South Africa. By W. G. Wickham. Published by the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. Price 1s. 6d.

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to* THE CHEMICAL AGE *by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.

Glasgow, December 20, 1923.

DURING the past week business in the heavy chemical market has been a little more satisfactory, numerous inquiries both for home and export being received, in proportion to which the number of orders booked was fairly good.

There is no change of importance to record either for home or continental products.

Industrial Chemicals

ACID ACETIC.—Export inquiries still being received. Glacial, 98/100%, £60 to £66 per ton; 80% pure, £49 to £50 per ton; 80% technical, £47 to £48 per ton, packed in casks, delivered, c.i.f. U.K. port, duty free.

ACID BORACIC.—Crystals or granulated, £48 per ton; powdered, £50 per ton, carriage paid U.K. stations, minimum ton lots.

ACID CARBOLIC (ICE CRYSTALS).—Still in poor demand. Makers now quote 1s. per lb.

ACID CITRIC (B.P. CRYSTALS).—Now quoted 1s. 4¾d. less 5%, ex store.

ACID FORMIC, 85%.—Spot material still available at about £62 per ton, ex store.

ACID HYDROCHLORIC.—In little demand. Price 6s. 6d. per carboy, ex works.

ACID NITRIC, 80%.—£23 10s. per ton, ex station, full truck loads.

ACID OXALIC.—Moderate inquiry. Price about 6d. per lb., ex store, spot delivery.

ACID SULPHURIC.—144°, £3 15s. per ton; 168°, £7 per ton, ex works, full truck loads. Dearsenicated quality 20s. per ton more.

ACID TARTARIC (B.P. CRYSTALS).—Moderate inquiry and price unchanged at about 1s. 1d. per lb., less 5% ex wharf.

ALUMINA, SULPHATE, 17/18% Iron free.—Quoted £8 5s. per ton, c.i.f. U.K. port, prompt shipment. Spot lots obtainable at about £8 12s. 6d. per ton, ex store.

ALUM, CHROME.—Price unchanged at £26 to £28 per ton, according to quality, delivered f.o.b. U.K. port.

ALUM, POTASH (LUMP).—English material unchanged at about £10 17s. 6d. per ton, f.o.b. U.K. port. Spot lots of continental material still available at about £11 10s. per ton, ex store.

AMMONIA ANHYDROUS.—Unchanged at about 1s. 5d. per lb., ex station, prompt delivery.

AMMONIA CARBONATE.—Lump, £29 5s. per ton; powder, £31 per ton, f.o.b. U.K. port for export.

AMMONIA LIQUID, 880°.—Unchanged at 3d. per lb., delivered. Containers extra.

AMMONIA MURIATE.—Grey galvanisers quality quoted £34 per ton, f.o.b. U.K. port for export. Fine white crystals on offer at about £28 per ton, ex store, spot delivery.

AMMONIA SULPHATE.—25¼% material, £13 2s. per ton; 25¾% neutral quality, £14 5s. per ton, ex works, December delivery.

ARSENIC, WHITE POWDERED.—Price for spot material about £70 to £71 per ton, ex store. Continental material inclined to be dearer at about £65 per ton, c.i.f. U.K. port.

BARIUM CHLORIDE, 98/100%.—English material unchanged at about £15 per ton, ex store.

BARYTES.—Finest white English unchanged at £5 5s. per ton, ex works. Good quality continental material offered at £5 per ton, c.i.f. U.K. ports.

BLEACHING POWDER.—Spot lots, £11 5s. per ton, ex station. Contracts 20s. per ton less. Manufacturers advise a reduction of 5s. per ton in the price to be charged as from January 1 next.

BORAX.—Granulated, £24 10s. per ton; crystal, £25 per ton; powdered, £26 per ton, carriage paid U.K. stations, minimum ton lots.

CALCIUM CHLORIDE.—English material unchanged at £5 12s. 6d. per ton, ex station. Manufacturers advise no change in price over next year. Continental offered at about £4 15s. per ton, ex store.

COPPERAS, GREEN.—Quoted £2 5s. per ton, f.o.b. U.K. port.

COPPER SULPHATE.—Moderate export inquiry. Price about £25 5s. per ton, less 5% f.o.b. U.K. port.

FORMALDEHYDE, 40%.—Quoted £63 to £65 per ton, ex store

GLAUBER SALTS.—Fine white crystals quoted £3 12s. 6d. per ton, ex store, spot delivery. Continental material still offering at about £3 per ton, c.i.f. U.K. port.

LEAD, RED.—English material unchanged at £45 per ton carriage paid U.K. stations. Continental advanced to £37 per ton, c.i.f. U.K. ports. Spot material available at £38 5s. per ton, ex store.

LEAD, WHITE.—Continental material unchanged at about £42 per ton, ex store, spot delivery.

LEAD ACETATE, WHITE CRYSTALS.—Spot material scarce. Continental quoted about £45 per ton, ex store. English material for export £46 per ton, f.o.b. U.K. port.

MAGNESITE, CALCINED.—Finest English material offered at £8 per ton, ex station.

MAGNESIUM CHLORIDE.—Unchanged at about £3 15s. per ton, ex store, spot delivery. Still on offer from the continent at about £2 12s. 6d. per ton, c.i.f. U.K. port.

MAGNESIUM SULPHATE (EPSOM SALTS).—Commercial quality offered at about £5 per ton, ex store. B.P. quality, £6 5s. per ton, ex station, prompt delivery.

POTASH, CAUSTIC, 89/92%.—Inclined to be higher at about £34 per ton, ex store, spot delivery. Offered from the Continent at about £30 10s. per ton, c.i.f. U.K. port.

POTASSIUM BICHROMATE.—Unchanged at 5¼d. per lb., delivered.

POTASSIUM CARBONATE, 96/98%.—Spot material still available at about £30 per ton, ex store. Offered from the continent at about £26 10s. per ton, c.i.f. U.K. port.

POTASSIUM CHLORATE.—Unchanged at about 3½d. per lb., ex store.

POTASSIUM NITRATE (SALTPETRE).—Small local inquiry. Quoted £32 10s. per ton, ex store, spot delivery.

POTASSIUM PERMANGANATE (B.P. Crystals).—Unchanged at about 10½d. per lb., ex store, spot delivery.

POTASSIUM PRUSSIATE (YELLOW).—Still in poor demand. Quoted 10½d. per lb., f.o.b. U.K. port, for export. Spot material on offer at about 10½d. per lb., ex station.

SODA CAUSTIC.—76/77%, £19 7s. 6d. per ton; 70/72%, £17 17s. 6d. per ton; 60/62% broken, £19 2s. 6d. per ton; 98/99% powdered, £22 15s. per ton. All ex station, spot delivery. Contracts 20s. per ton less. Manufacturers advise no change in price for next year.

SODIUM ACETATE.—Spot material inclined to be higher at £26 5s. per ton, ex store.

SODIUM BICARBONATE.—Refined recrystallised quality, £10 10s. per ton, ex quay or station. M.W. quality 30s. per ton less. Manufacturers advise no change in price for next year.

SODIUM CARBONATE.—Soda Crystals, £5 to £5 5s. per ton, ex quay or station. Alkali 58%, £8 12s. 3d. per ton, ex quay or station.

SODIUM HYPOSULPHITE.—English makers' price about £10 per ton, ex station. Continental obtainable at about the same figure. Pea crystals quoted £15 per ton, ex store.

SODIUM NITRATE.—Refined 96/98% quality unchanged at about £13 5s. per ton, f.o.r. or f.o.b. U.K. port.

SODIUM NITRITE, 100%.—Quoted £26 10s. to £28 10s. per ton according to quantity, f.o.b. U.K. port.

SODIUM PRUSSIATE (YELLOW).—In little demand. Price about 5½d. per lb., ex store.

SODIUM SULPHATE (SALTCAKE).—Price for home consumption £4 5s. per ton, carriage paid stations. Good export inquiry.

SODIUM SULPHIDE.—60/62% solid, £15 per ton, ex station; broken, £1 per ton more. 31/34% crystals, £9 7s. 6d. per ton, ex station

SULPHUR.—Flowers, £10 per ton; roll, £9 per ton; rock, £9 per ton; ground, £8 per ton. Prices nominal.

TIN CRYSTALS.—Unchanged at 1s. 3¾d. per lb., f.o.b. U.K. port, or delivered.

ZINC CHLORIDE.—98/100% solid offered at about £26 per ton, f.o.b. U.K. port, for export.

NOTE.—The above prices are for bulk business, and are not to be taken as applicable to small parcels.

Coal Tar Intermediates and Wood Distillation Products

ANTHRANILIC ACID.—Small home inquiry. 8s. lb. (100%), delivered.

CLOVE ACID.—Small export inquiry. Price 3s. 7d. lb. 100% basis, f.o.b.

DINITROBENZOL.—Large export inquiry. Price 1s. 1d. per lb., f.o.b.

GAMMA ACID.—Small export inquiry. Price 13s. lb. 100% basis, f.o.b.

CHROMOTROPE ACID.—Small export inquiry. Price 9s. lb. 100% basis, f.o.b.

META NITRANILINE.—Small home inquiries. Price 5s. 4d. lb., delivered.

NITROSOPHENOL.—Large export inquiry. Price 3s. 9d. lb., f.o.b.

ORTHO NITROTOLUOL.—Supplies plentiful. Price 4¾d. lb., f.o.b., drums included.

ORTHO AMIDOPHENOL.—Small home inquiry. Price 12s. lb., 100% basis, delivered.

PARA TOLUIDINE.—Small home inquiry. 4s. 9d. lb., delivered.

PARA PHENYLENEDIAMINE.—Moderate demand. Price 10s. 6d. lb., 100% basis, carriage paid.

PARA NITROTOLUOL.—Export inquiry. Price 2s. 4d. lb., f.o.b.

TOBIAS ACID.—Some inquiry. Price 5s. 9d. lb., 100% basis, carriage paid.

Pulverised Fuel and Efficient Steam Generation

MR. DAVID BROWNLIE read a paper on this subject before the Institution of Electrical Engineers in London on Thursday, December 13.

The paper, which was illustrated by numerous lantern slides, was a detailed consideration of the whole question of the application of pulverised fuel to steam generation, more especially from the point of view of the "Lopulco" system for large water-tube boilers and the efficient generation of electricity in power stations. By the courtesy of Mr. W. R. Wood of the Underfeed Stoker Co., Ltd., very extensive data were given, part of which had not before been published, relating to the pioneer large pulverised fuel-fired electricity station, the "Lakeside" station of Milwaukee, together also with a description of the River Rouge power plant of the Ford Motor Co., at Dearborn, Detroit, using pulverised fuel and blast furnace gas, and which the author stated was the most remarkable power plant in the world. For comparison, by the courtesy of Mr. R. B. Mitchell, there were given the figures of the Dalmarnock electricity station, Glasgow, one of the largest and most modern and efficient in Great Britain, of course working with mechanical stokers. A thorough consideration then followed, based on these actual results of the advantages and disadvantages of pulverised fuel. The paper contained numerous columns of statistics, figures, diagrams and illustrations, the slides including 20 views of the Ford plant at Detroit and about a dozen of Lakeside, Milwaukee.

One of the chief impressions of the paper was the urgent necessity for the adoption in Great Britain of improved scientific methods, particularly in connection with the production of cheaper power, and the application of pulverised coal to steam generation was a striking example of the way we were lagging behind the United States. The author gave as his opinion—based on his own investigations for over 15 years past into the operation of steam boilers in Great Britain, work which had included a detailed scientific investigation of the working of 400 different steam boiler plant installations, representing 1,513 boilers, in 41 different industries with an annual coal bill of 3,250,000 tons—that the average steam boiler plant efficiency throughout Great Britain was only 58 per cent. As a result also of a further personal inspection of nearly 2,000 boiler plants, equivalent to a consumption of 15,000,000 tons of coal per annum, his final conclusion was that the average efficiency with which 90,000,000 tons of coal was burnt per annum in the steam boilers of Great Britain was less than 60 per cent., representing an avoidable loss to this country, because of the lack of scientific methods, of no less than 20,000,000 tons of coal per annum. One of the chief difficulties in the proper consideration of the whole question is the fact that, according to the author, there is at present no satisfactory boiler testing code in the world.

The Manchester Chemical Market

[FROM OUR OWN CORRESPONDENT].

Manchester, December 20, 1923.

THE position of the chemical market here is much the same as at last report. Business is slow both on home and foreign account, and is likely to remain so for some weeks at all events. Traders, however, report a fair volume of inquiries in connection with contract deliveries over next year. In the meantime quotations for most lines of chemicals, considering the amount of actual business that is being done, remain steady.

Heavy Chemicals

Hyposulphite of soda is very quiet again, although current quotations show little change; commercial is on offer at £10, and photographic crystals at about £15 per ton. Bleaching powder meets with a fairly active demand; makers have reduced prices by 5s. per ton for next year's deliveries. Salt-cake is maintained at round £4 10s. per ton; a moderate export demand is still being met with, but the amount of business done on home consumption account shows little sign of improvement. Phosphate of soda is quiet, and values are on the easy side at £14 to £14 10s. per ton. The home trade demand for caustic soda is still restricted, and export business also at the moment is less active; prices are firm at from £16 17s. 6d. per ton for 60 per cent. material to £19 7s. 6d. for 76-77 per cent. Alkali is firm and in moderate inquiry at £7 10s. per ton for 58 per cent. quality. The demand for sulphide of sodium proceeds on only moderate lines, with prices unchanged from last week at £14 10s. per ton for 60-65 per cent. concentrated solid and £9 per ton for crystals. Glauber salts are quiet but steady at £3 10s. per ton. Nitrite of soda is still in rather short supply, and values are very firm at £28 10s. to £29 per ton. Prussiate of soda is inactive, and quotations are easier again at 5¼d. per lb. Soda crystals are rather quiet at about £5 5s. per ton. Bichromate of soda is firm and in fair demand at 4½d. per lb. Bicarbonate of soda is moderately active, and values are unchanged at round £10 10s. per ton. Acetate of soda is quiet but steady at £23 10s. per ton. Chlorate of soda is still quoted at about 3d. per lb., though not much is being disposed of at the moment.

Caustic potash and carbonate of potash are said to be selling rather freely. Caustic is steady at round £30 per ton; carbonate is still quoted at £24 for 90 per cent. and £26 per ton for 96 per cent. Yellow prussiate of potash is again weaker at about 9½d. per lb.; actual business shows little indication of improvement. Permanganate of potash, also, keeps very quiet with quotations ranging from 8¾d. to 9d. per lb. Chlorate of potash is steady and in moderate request at about 3d. per lb.

The spurt which recurred in arsenic some weeks ago seems to have died out; at all events, the demand is now less pressing, although the current quotation for white powdered, Cornish makes, is about unchanged at £70 per ton Manchester. A shade more movement in sulphate of copper has been reported, and prices are fairly steady at £25 10s. per ton, f.o.b. Epsom salts are in fair demand at £4 5s. per ton for commercial, and about £6 5s. per ton for magnesium sulphate, B.P. Grey acetate of lime is quiet at about £21 per ton; brown is in rather better supply at £14 per ton. Lead acetates continue very firm, both white and brown being quoted at round £45 per ton. Nitrate of lead is quiet but steady at about £44 per ton.

Acids and Tar Products

Acetic acid meets with a fair inquiry, and prices are firm; commercial, 80 per cent. quality, is quoted at £46 to £48 per ton, and glacial at about £65. The other acids show little movement. Both tartaric and citric are quiet, with values steady at 1s. 1¼d. and 1s. 4½d. per lb. respectively. Oxalic acid keeps dull although the quotation has been maintained at 5¾d. per lb.

Export inquiries for pitch are rather numerous, though actual business is of small dimensions; values are rather stronger at round £5 10s. per ton; f.o.b. A good demand for creosote oil for shipment is still being met with, and prices are firmer at 10d. per gallon. Solvent naphtha is quiet but steady at 1s. 3d. per gallon. Carbolic acid is rather firmer, crystal being quoted at 1s. and crude 2s. 9d. to 3s. per gallon. Naphthalenes are stronger, although the demand is far from pressing; refined is offering at £19 to £20 per ton, and crude at £6 to £11, according to grade.

Company News

BENN BROTHERS, LTD.—The directors announce usual interim dividend of 5 per cent., payable on January 1.

RECKITT AND SONS.—The directors have declared quarterly dividend on the ordinary shares of 8d. per share, the same as a year ago.

AMMONIUM FINANCE.—The accounts for the year 1922 show an excess of income over expenditure of £1,567, reducing the debit balance brought in to £6,642.

NATIONAL PETROLEUM.—The net profit for the eighteen months to June 30 last, amounted to £3,409, reducing the debit balance brought in to £18,286.

TARSLAG (1923).—A dividend is announced at the rate of 8 per cent. per annum on the preference shares for the period ending December 31, payable on January 1.

ASBESTOS CORPORATION OF CANADA.—The usual dividend on the preferred stock of 1½ per cent. for the quarter ending December 31, has been declared payable on January 15.

SHAWINIGAN WATER AND POWER.—A dividend of 1¾ per cent. for the quarter ending December 31 has been declared, payable on January 10 to holders of record on December 24.

JOSEPH NATHAN AND CO.—The directors announce the payment of the half-year's dividend on the 7 per cent. "A" preference shares. Warrants will be posted on December 31.

EXPLOSIVES AND CHEMICAL PRODUCTS, LTD.—A dividend is announced at the rate of 2s. 6d. per share, free of tax, being 6d. per share for each of five years to June 30 last, payable on December 27.

BRITISH CYANIDES, LTD.—In a circular letter, dated December 15, the secretary states that the directors feel that the conditions of trade do not justify them in declaring an interim dividend on the ordinary shares.

UNITED INDIGO AND CHEMICAL CO.—The directors announce interim dividends for the six months to December 31 at the rate of 5 per cent. per annum on the participating cumulative preference shares and at the rate of 5 per cent. per annum on the ordinary shares, less tax at 4s. 6d. in the £, payable on December 29.

CHARLES MARSDEN AND SONS.—Mr. Justice Romer, on a petition by Charles Walmsley and Co., judgment creditors for over £28,000, ordered the compulsory liquidation of Charles Marsden and Sons, Ltd., one of the Becker group of paper manufacturers, with mills at Barnsley, Wakefield, Tamworth and Salford, and a large warehouse at Sheffield.

DE BEERS CONSOLIDATED MINES.—The directors have declared an interim dividend of 20 per cent. (10s. per share) on preference shares, in respect of the financial year ending June next. In respect of 1921–22 there was no distribution on either class of shares, but in January last 30 per cent. was paid on account of arrears of preference dividend.

ELECTROLYTIC ZINC CO. OF AUSTRALIA.—The net profits for the year ended June 30 last were £285,405, after adding £90,000 to the depreciation reserve, and £76,593 was brought forward. After payment of dividends already declared, writing off preference and debenture issue expenses, amounting to £74,481, and adding £40,000 to equalisation reserve, £78,262 was carried forward.

PEACHEY PROCESS CO., LTD.—At the annual ordinary meeting held in London on December 15, the chairman, Sir Robert W. Gillan, in moving the adoption of the report and accounts, called attention to the economies which had been effected in the company's expenditure; £92,973 had already been called up, but there was still £13,282 uncalled capital, which he hoped it would not be necessary to call upon.

SCARAB OIL BURNING CO.—The report for the year ended February last states that trading showed a loss of £16,610. Trials are now taking place with the company's equipment fitted to locomotives of several South American railways, and when success of these trials is established satisfactory orders may be expected from this quarter. A year ago the company completed the erection of furnaces and works for carrying out the process of calorising, and have since developed this new business rapidly. The first nine months' working of this process registered a loss, but it is now securely established.

VAR OIL AND COAL CO.—Interest receipts for the year to March 31 last amounted to £1,621 (against £3,659 in 1921–22). After deducting directors' fees and London expenses, there is a debit balance of £1,682. The balance sheet shows, after deducting £1,054 for income tax from March 12, 1920, to April 5, 1923, and allowing for the credit of £1,788 as per last account, a debit to income and expenditure account of £948. Advances to the French company during the year totalled £30,457, making £146,609 since the company's incorporation. The report details the operations of the French company. It is stated that it has been found impossible to adhere to the estimate made at the last general meeting, that the cash resources would be sufficient to finance the French company, until the retorts had been erected and were in profitable operation. The cost of the French company's 1924 programme is estimated at £54,000, and at the general meeting the directors will seek authority to raise this sum on terms which will be then stated.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

CHEMICALS FOR AUSTRIA.—An agent in Vienna with good knowledge of the local market desires to secure the representation on a commission basis of British manufacturers and exporters of chemicals. (Reference No. 671.)

CHEMICALS REQUIRED IN SPAIN.—A commission agent of Barcelona is desirous of obtaining the representation of British manufacturers of sodium sulphide, chloride of barium, oxalic acid, lead acetate and sodium bicarbonate. (Reference No. 676.)

Contracts Open

Tenders are invited for the following articles. The latest dates for receiving tenders are, when available, given in parentheses:

BRITISH INDIA (January 8).—Permanganate of potash. Tender forms are available on application to the Director-General, India Store Department, Branch No. 10, Belvedere Road, Lambeth, London, S.E.1.

SOUTH AFRICA (January 29).—Supply and delivery at Vredeorp store of 135 tons (2,000 lb.) of creosote in steel drums. Particulars from the Department of Overseas Trade (Room 52), 35, Old Queen Street, London, S.W.1. Reference No. 12794/E.D./C.C./2.

EGYPT (January 7).—Paints (mixed and in powder), varnishes, various oils (boiled and raw linseed), shellac, tallow, soap, etc. Specification, conditions, and form of tender may be seen on application to the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. Reference No. 11944/F.E./C.C.

Chemical Engineers' Affairs

AT the statutory meeting of creditors in the voluntary winding-up of Chambers and Hammond, Ltd., Lightcliffe, Yorkshire, the deficiency as regards creditors, according to the statement of affairs submitted, was £5,550, there being 93 unsecured trade creditors for £4,706, total liabilities of £8,115 and net assets estimated to produce £2,565. For the twelve months to December 31, 1922, a loss of £3,326 was shown, and from January 1 to November 28, 1923, a further loss of £5,344. The subscribed capital of the company was £14,063. The meeting confirmed the voluntary winding-up, with Mr. Thomas Paton and Mr. N. R. Dickinson as joint liquidators, and appointed an advisory committee consisting of Mr. J. E. Schofield (Mark Shaw and Sons, Ltd.), Mr. J. B. Farrand, and Mr. W. Findlay.

Carbon Dioxide in Butter Making

CARBON dioxide is reported as being used profitably in Holland in making a more durable butter by churning in an atmosphere of gas. The air is withdrawn from the churn and replaced with carbon dioxide, and the portion worked into the butter remains a long time with ordinary handling, thus keeping out oxygen to which deterioration is chiefly due.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

County Court Judgments

[*NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.*]

LAMBERT (SAMUEL) AND CO., LTD., 10, Great St. Helens, E.C., drug brokers. (C.C., 22/12/23.) £13 6s. 11d. November 2.

STACEYS CASH CHEMISTS, LTD., 409, Wandsworth Road, chemists. (C.C., 22/12/23.) £14 2s. October 12.

THOMPSON (H. R.) (CASH CHEMISTS), LTD., 190, Bishopsgate, E.C., chemists. (C.C., 22/12/23.) £14 14s. 4d. November 16.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

AFRICAN MANGANESE CO., LTD., London, E.C. (M., 22/12/23.) Registered December 5, £16,000 debenture stock, part of £600,000; charged on certain concessions in Gold Coast Colony, also general charge.

HARDING CHEMICAL CO., LTD., Manchester. (M., 22/12/23.) Registered December 6, £2,000 debentures (filed under sec. 93 (3) of the Companies (Consolidation) Act 1908), present issue £1,300; general charge. *Nil. December 15, 1922.

ORGANAM, LTD. (late ELSTREE CHEMICAL WORKS (1922), LTD.). (M., 22/12/23.) Registered December 3, £2,000 debenture, to Branch Nominees, Ltd., 15, Bishopsgate, E.C.; general charge.

POTTSGHYLL BARYTES MINING CO., LTD., London, E.C. (M., 22/12/23.) Registered November 30, £4,760 19s. 6d. 1st debenture, to C. H. Pryor, 222, Strand, W.C., solicitor; general charge. *Nil. December 31, 1922.

SPOONER AND BAILEY, LTD., Eling, chemical manufacturers. (M., 22/12/23.) Registered December 5, £500 (not ex.), £12,000 (not ex.), and £100 (not ex.) mortgages, to bank; charged on various properties at Eling, Southampton. *Nil. August 9, 1923.

UNITED CHEMICAL CORPORATION, LTD., London, S.W. (M., 22/12/23.) Registered December 5, £2,000 debenture, to A. Moray, 44, Fitz George Avenue, Kensington, company director; general charge. *Nil. December 28, 1922.

Satisfaction

ORGANAM, LTD. (late ELSTREE CHEMICAL WORKS (1922), LTD.). (M.S., 22/12/23.) Satisfactions registered December 3, £550, registered November 3 and November 8, 1923.

London Gazette

Companies Winding Up Voluntarily

HORSFIELD (J. N.) AND SONS, LTD. (C.W.U.V., 22/12/23.) J. L. Kirby, 1, Cookridge Street, Leeds, chartered accountant, appointed liquidator.

STONE (M. L.) AND CO., LTD. (C.W.U.V., 22/12/23.) J. Stone, 55, Driffield Road, Bow, London, E.3, appointed liquidator.

Company Winding Up

SCHOLES (JOHN R.) AND CO., LTD., 14, Argyll Chambers, 67, Hanging Ditch, Manchester. (C.W.U., 22/12/23.) Meetings of creditors, December 24, 1923, 11 a.m.; and of contributories, December 24, 11 a.m., Official Receiver's Offices, Byrom Street, Manchester.

New Companies Registered

CIELA PHOTOGRAPHIC SUPPLIES, LTD., P. and O. House, Cockspur Street, London, S.W.1. Manufacturers, importers, exporters and shippers of and dealers in chemicals, glass and glassware, compounds, cements, oils, paints and pigments, etc. Nominal capital, £2,000 in 1,995 10 per cent. cumulative preference shares of £1 and 100 ordinary shares of 1s.

ENZYMETAN, LTD., 365, Bank Chambers, 329, High Holborn, London, W.C.1. To acquire from J. S. Burns and C. J. M. le Petit all their rights in a scientific process in connection with the preparations of hides for tanning into leather. Nominal capital, £10,000 in 5s. shares.

KYNASTON, LTD., Connaught Mansions, 34, Victoria Street, Westminster, London. Chemists, druggists, chemical manufacturers, drysalters, manufacturers of and dealers in mineral waters, etc. Nominal capital, £50,000 in 45,000 8 per cent. cumulative participating preference shares of £1 and 100,000 ordinary shares of 1s.

METAL TREATMENT CO., LTD., Fitzalan House, Arundel Street, Strand, London. Electro chemists and metallurgists, etc. Nominal capital, £2,000 in £1 shares.

PREMIER MANUFACTURING CO., LTD. Drysalters, manufacturers, exporters, etc. Nominal capital, £500 in £1 shares. A director: J. H. Mason, 45, Lisson Grove, London, N.W.1.

Gas Fumigation of Ships

Medical Officer's Narrow Escape

THE Liverpool coroner last week held an inquest on W. C. Hall, a scaler, employed by the General Scaling and Painting Co., Ltd., who died from the effects of gas poisoning following the fumigation of the steamer *Barrymore*.

Dr. Charles F. White, assistant port medical officer of Liverpool, who supervised the opening up of the *Barrymore* after it had been fumigated, said that a cage containing a live rat was lowered in the bottom of the forepeak. It remained there for five minutes, and on being brought up the rat appeared to be quite unaffected. It was then lowered to the other side of the forepeak and was again unaffected after five minutes' exposure. Subsequently, he himself went down the lower peak and remained there for five minutes. From his investigation he concluded that the compartment was free from gas in any dangerous quantities. Later Hall was instructed to go down to the forepeak and remove a generating barrel containing sulphuric acid and sodium cyanide. Hall commenced to move the barrel towards the hatch, and suddenly he shouted out, "I have upset half of it." The barrel was tilted over, and he shouted to Hall, "Come out quick!" Hall got to the ladder, when he fell backwards. "I immediately jumped down into the lower peak," Dr. White stated, "and called for help and a rope to the men above. I seized Hall by the shoulders, and was attempting to drag him to the top of the ladder, when I fell unconscious, and remembered nothing more until I woke up on deck. I was not able to take any further part in the rescue work." Witness's opinion was that the forepeak was clear of gas in dangerous quantities before Hall went down. When the contents of the barrel were spilled hydrocyanic acid gas was generated.

The jury returned a verdict of "Death by misadventure."

Recent Wills

Mr. Henry Hart, of Wellington Road North, Heaton Chapel, Lancs, chemical salesman £41,656

Mr. Rowland Stagg, of 14, Hayne Road, Beckenham, Kent, manufacturing chemist £10,375

Lieut.-Colonel Alfred Conway Bishop, of Rutland Gate, London, S.W.7, chairman of Kemball, Bishop and Co., Ltd..... £192,485